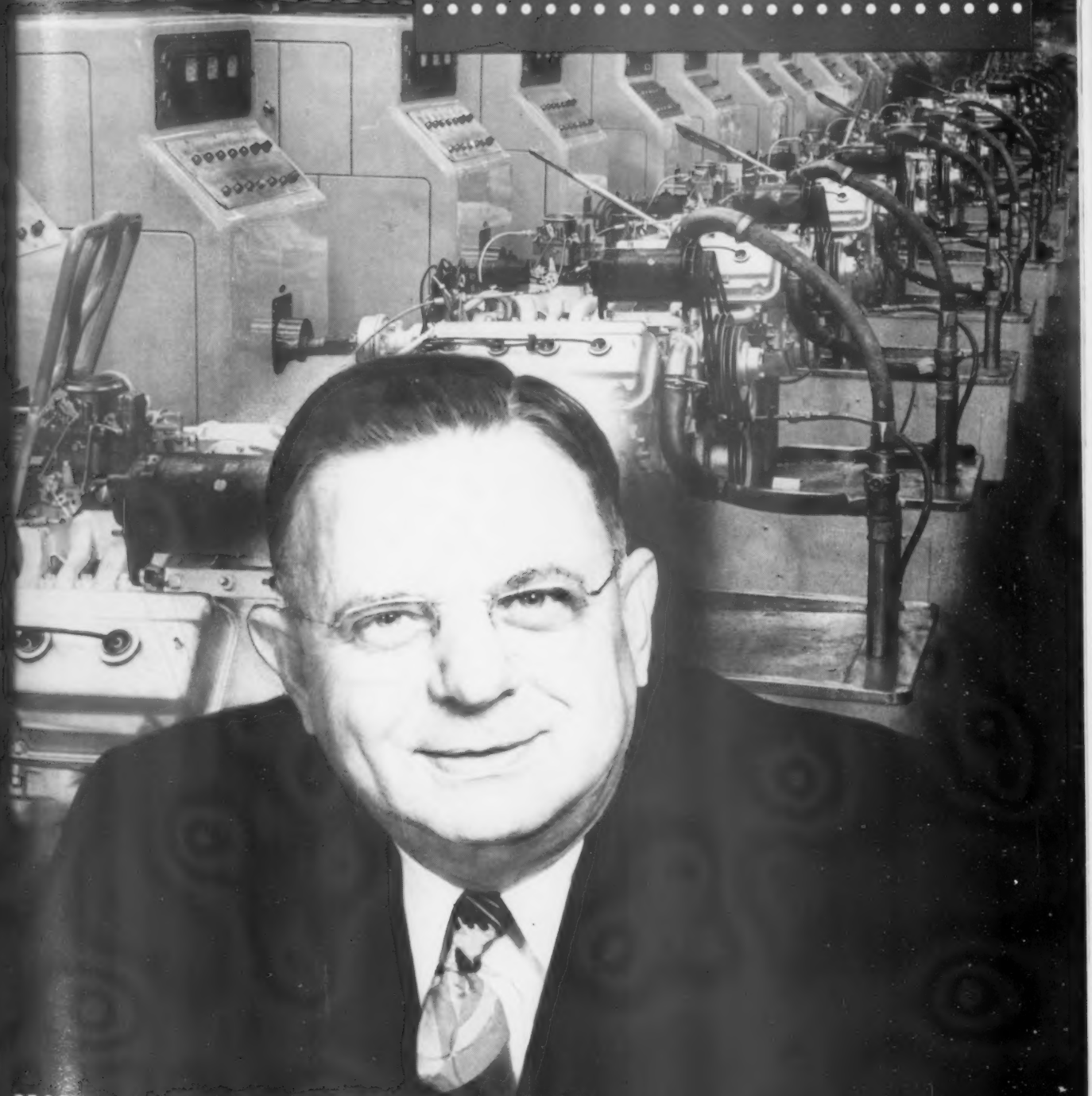
The Tool Engineer



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PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

FEBRUARY, 1952

VOLUME XXVIII, No. 2

PLANNING
ENGINEERING
CONTROL
OF
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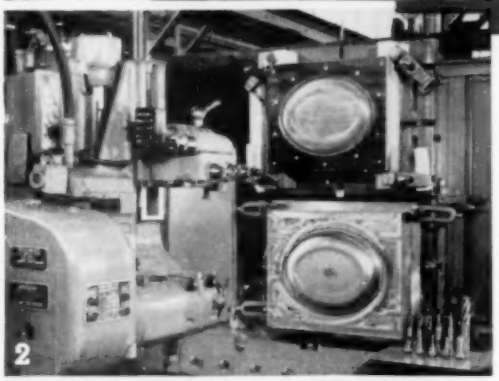

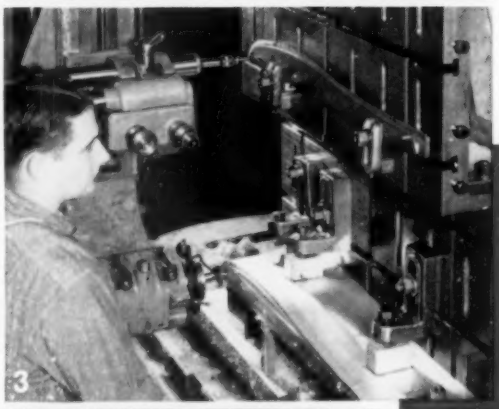

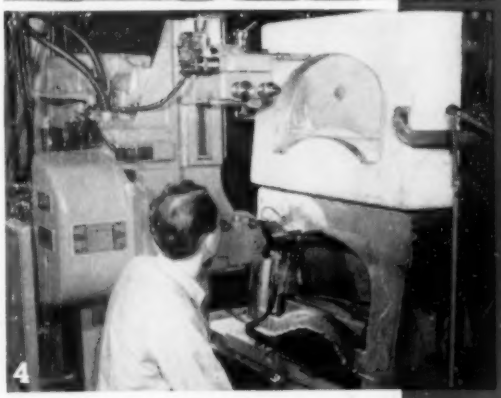

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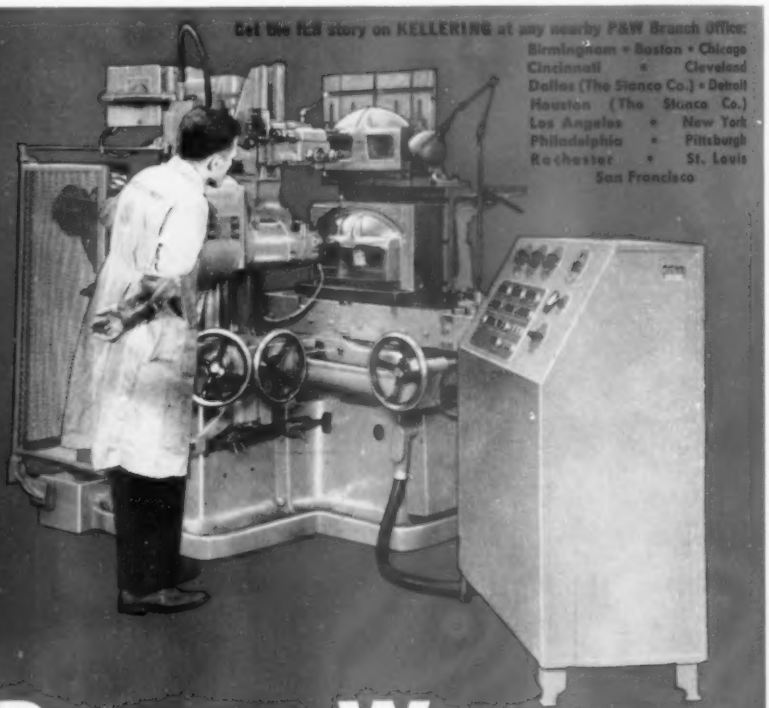
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1 Milling an intricate draw die for aluminum aircraft wind deflectors by tracing a plaster model.

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3 Profile-milling an experimental wind tunnel nozzle part, tracing from inexpensive template.

4 Horizontal design of the Keller allows coolant to wash chips from cavity of this tough forming die.

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VOLUME XXVIII
NUMBER 2
FEBRUARY, 1952

The Tool Engineer

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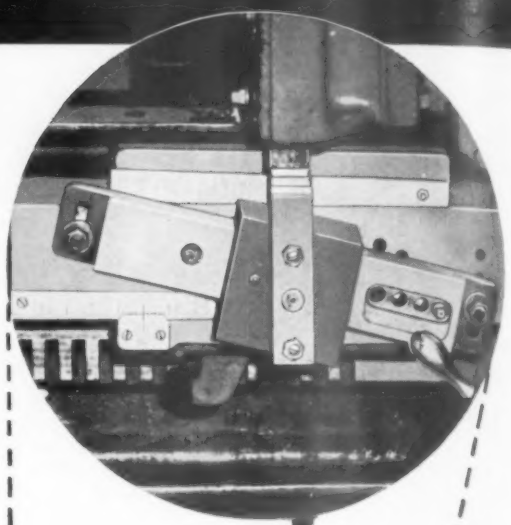

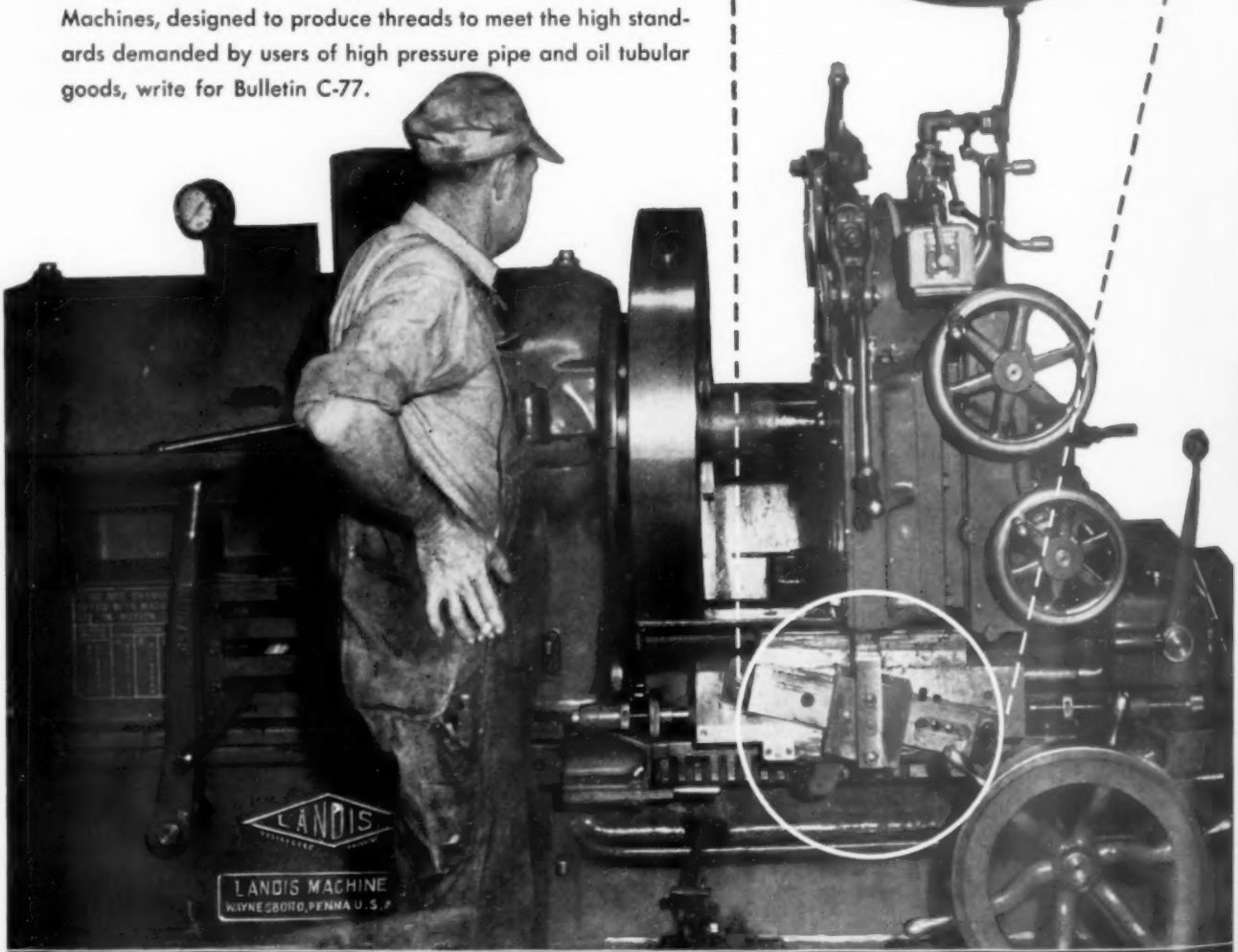

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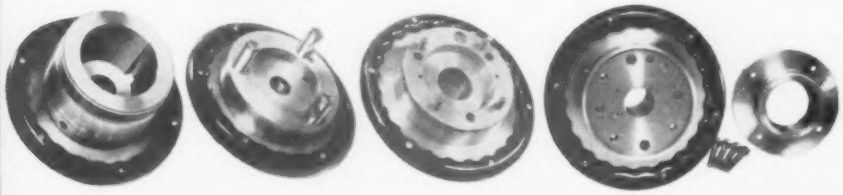

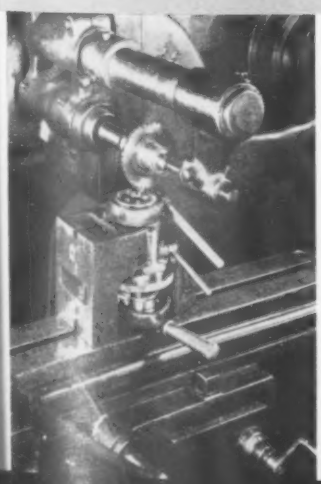

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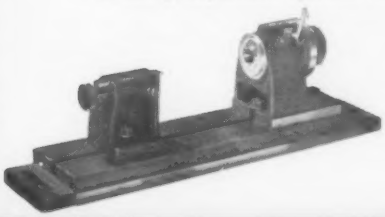
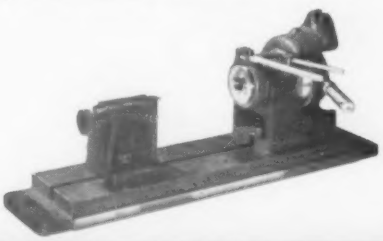


H-4



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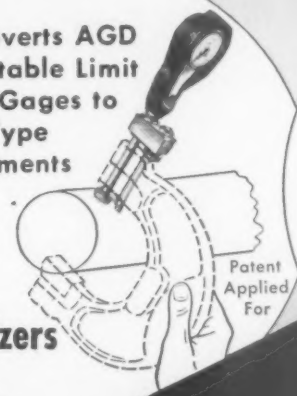

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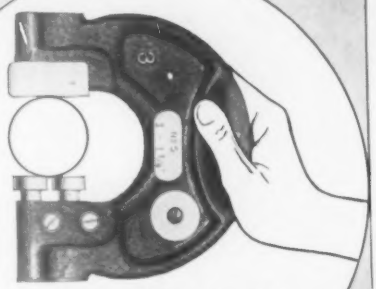

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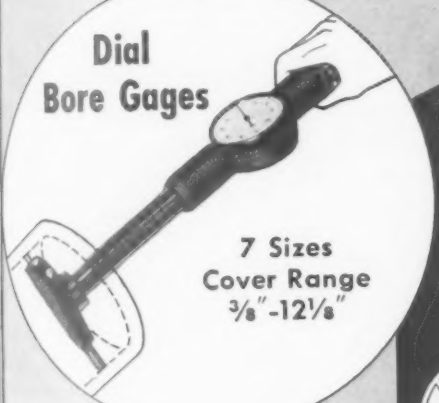
Dial Bore Gages



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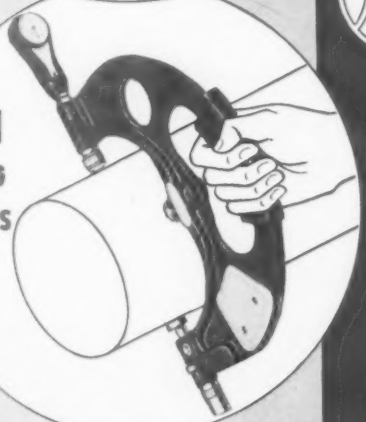

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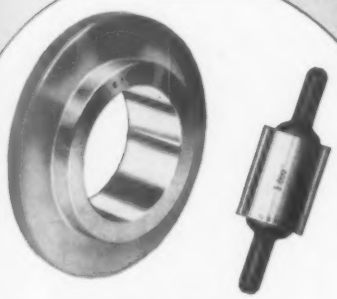

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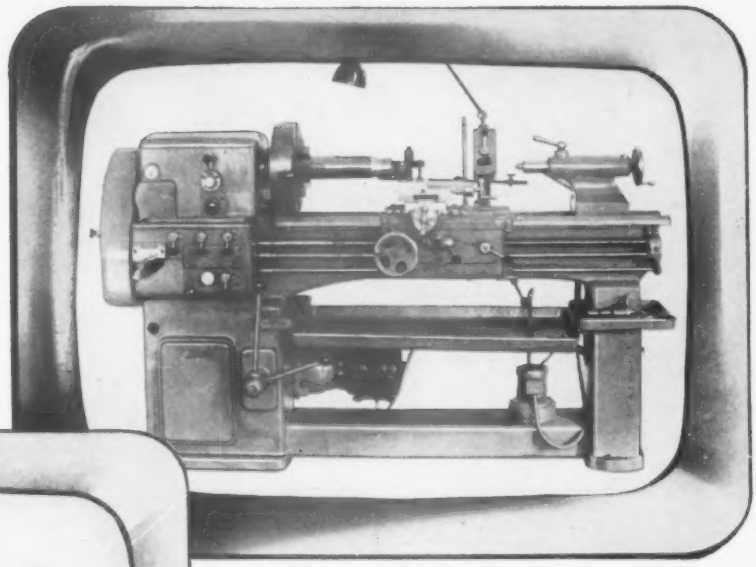
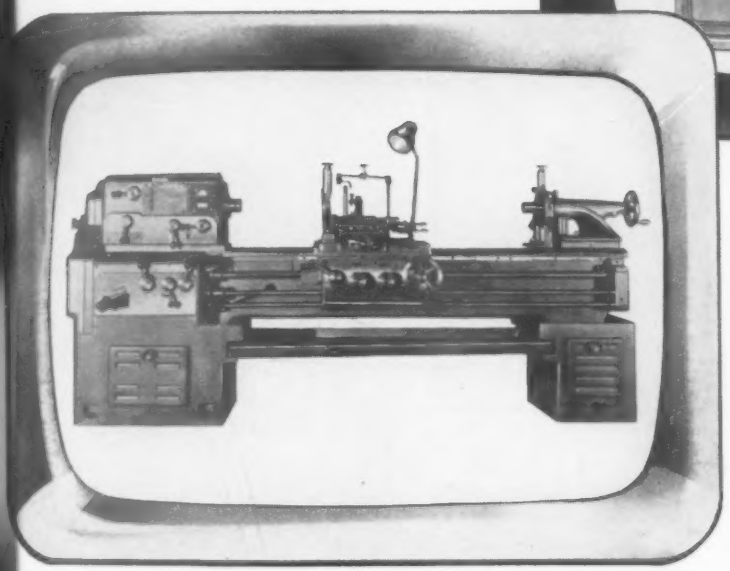


13" DIMCO Engine Lathe
(Geared Head) Model DBC 175



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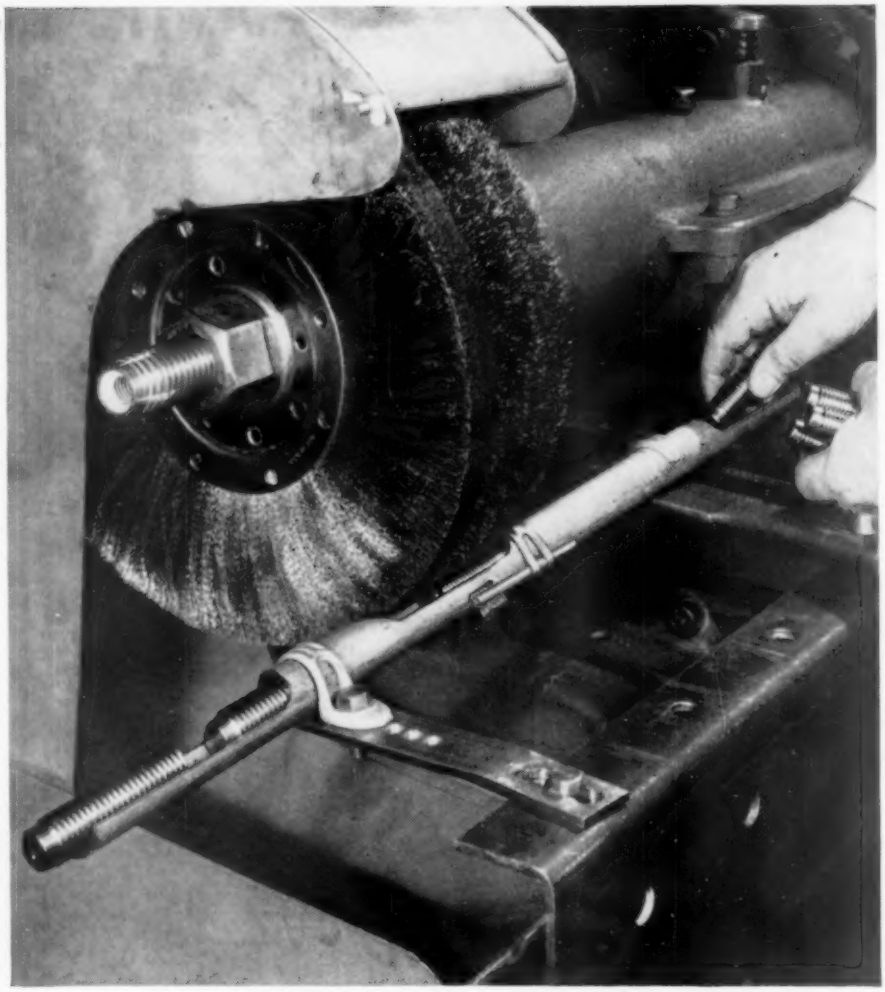

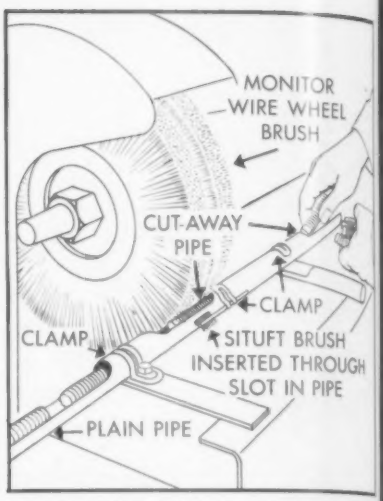

THE FIXTURE. This sketch shows how to make pipe fixture for deburring and polishing small parts, threaded or smooth. Can be made of steel, fiber or plastic tubing.

How to find an 800% production increase in a piece of pipe

You can save manpower and money in countless ways when you tap the idea resources of power brushing. For example:

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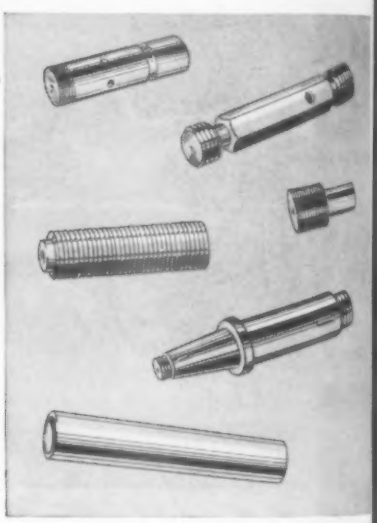
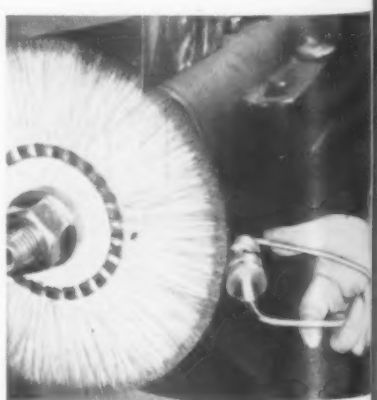


TYPICAL PARTS. Set screws, pins, pieces of tubing and other parts such as these can be cleaned and finished in the pipe fixture or in the forceps shown below.

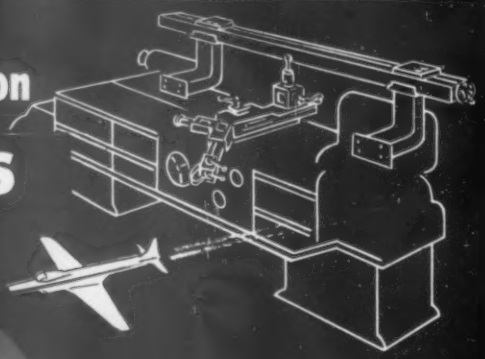


ANOTHER SIMPLE APPROACH. For small parts such as bushings, a simple forcep fixture can be devised to hold parts for power brushing. This one is made of wire.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-10

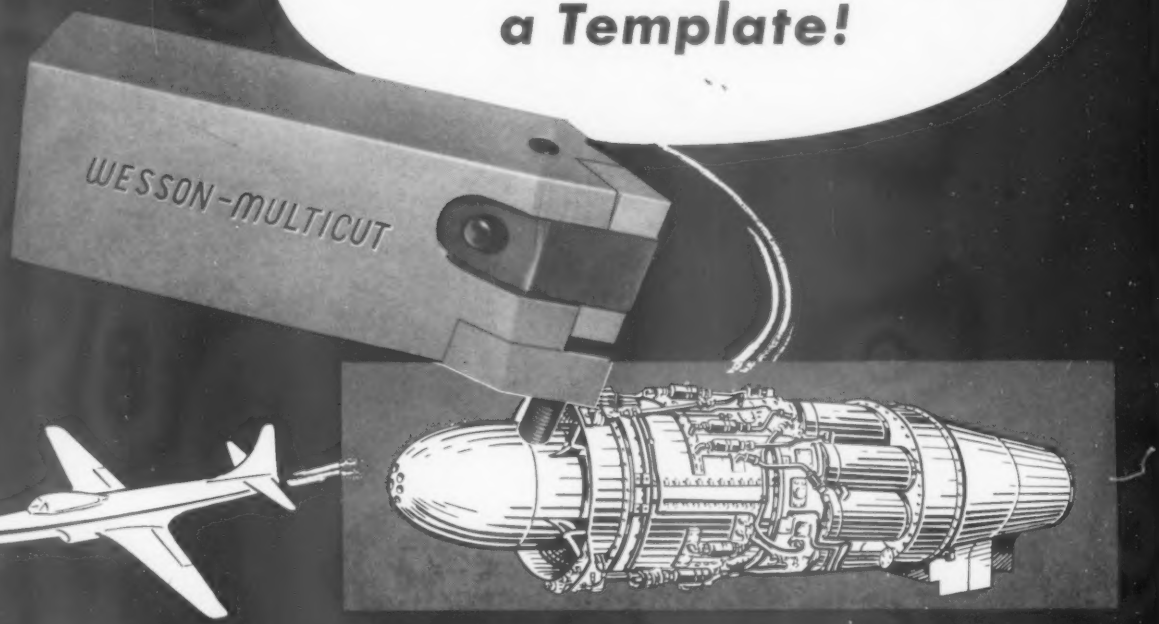
Developed for Jet Engine Production on

"FOLLOWER" LATHES



WESSON MULTICUT *style* 10

The Tool Holder that takes orders from a Template!



. . . and Makes Jet Engine Production Jump!

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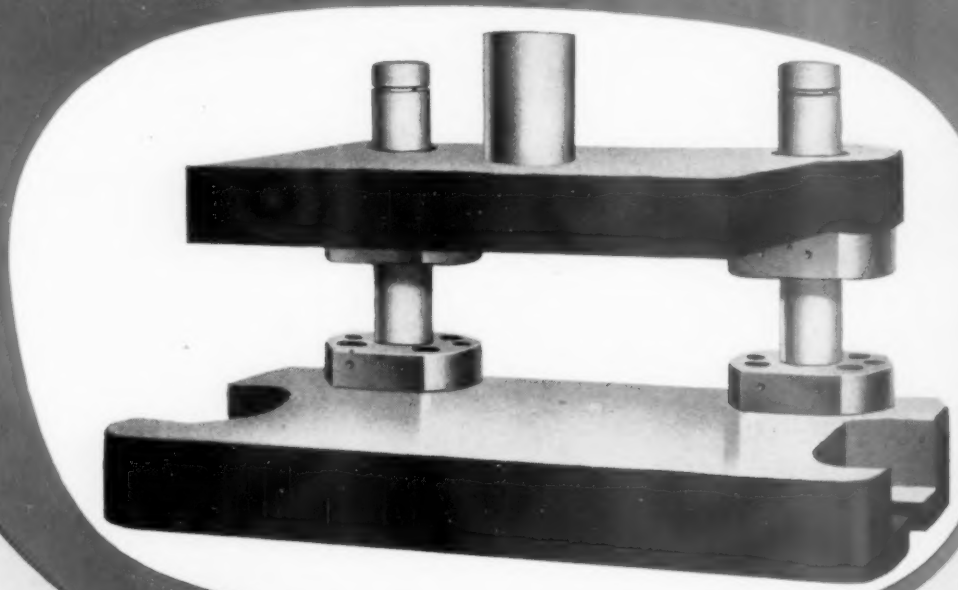

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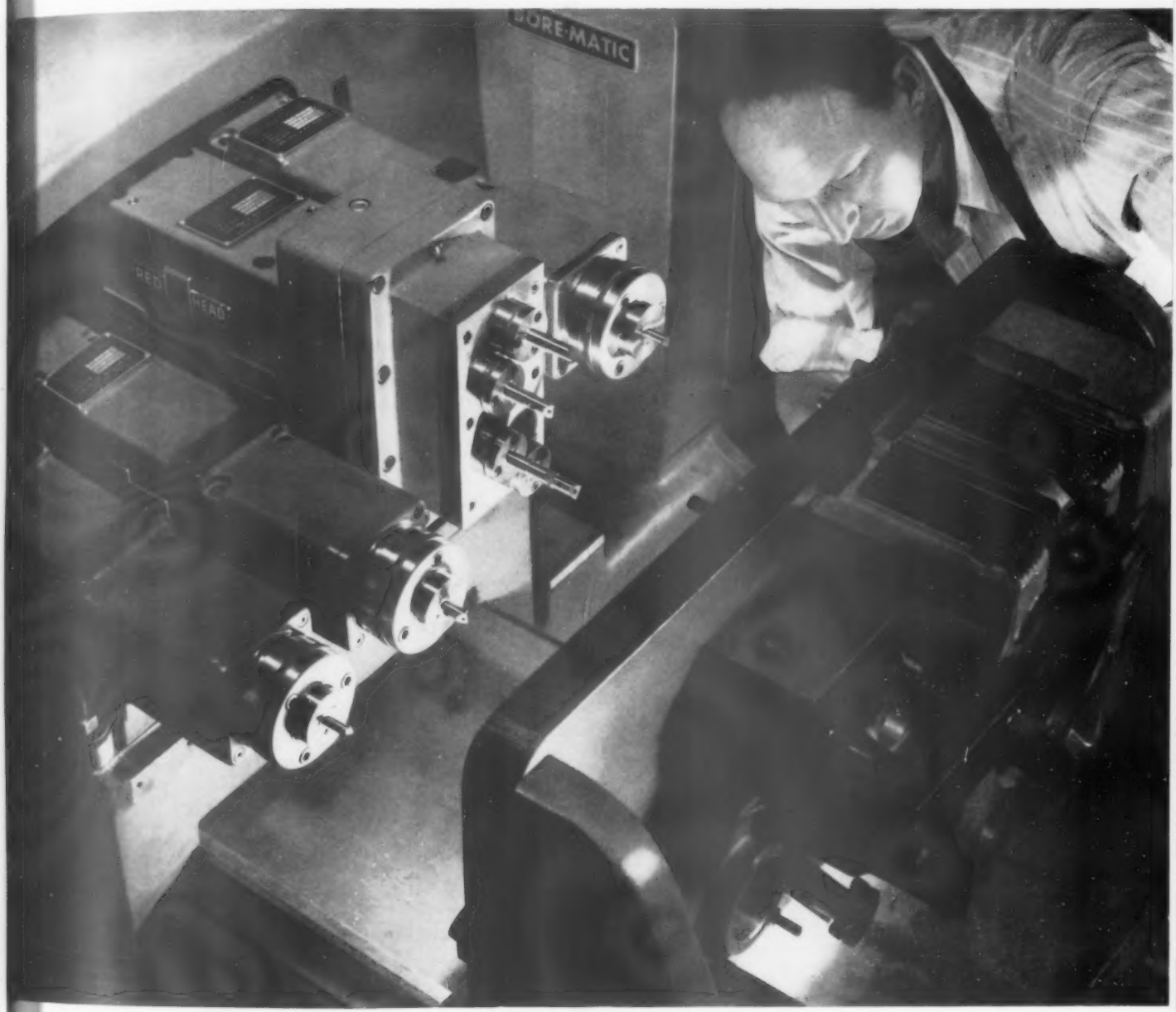
to boost our defense production



THE Heald Model 321 Bore-Matic shown above makes fast work of precision borizing on an important tank component. By combining three standard heads and one cluster head, five stud holes and two dowel holes are borized simultaneously in a single, automatic cycle. Bore size is held to 0.0005 inches. This is a typical example of how Heald precision finishing machines are speeding defense production in vital industries the country over.

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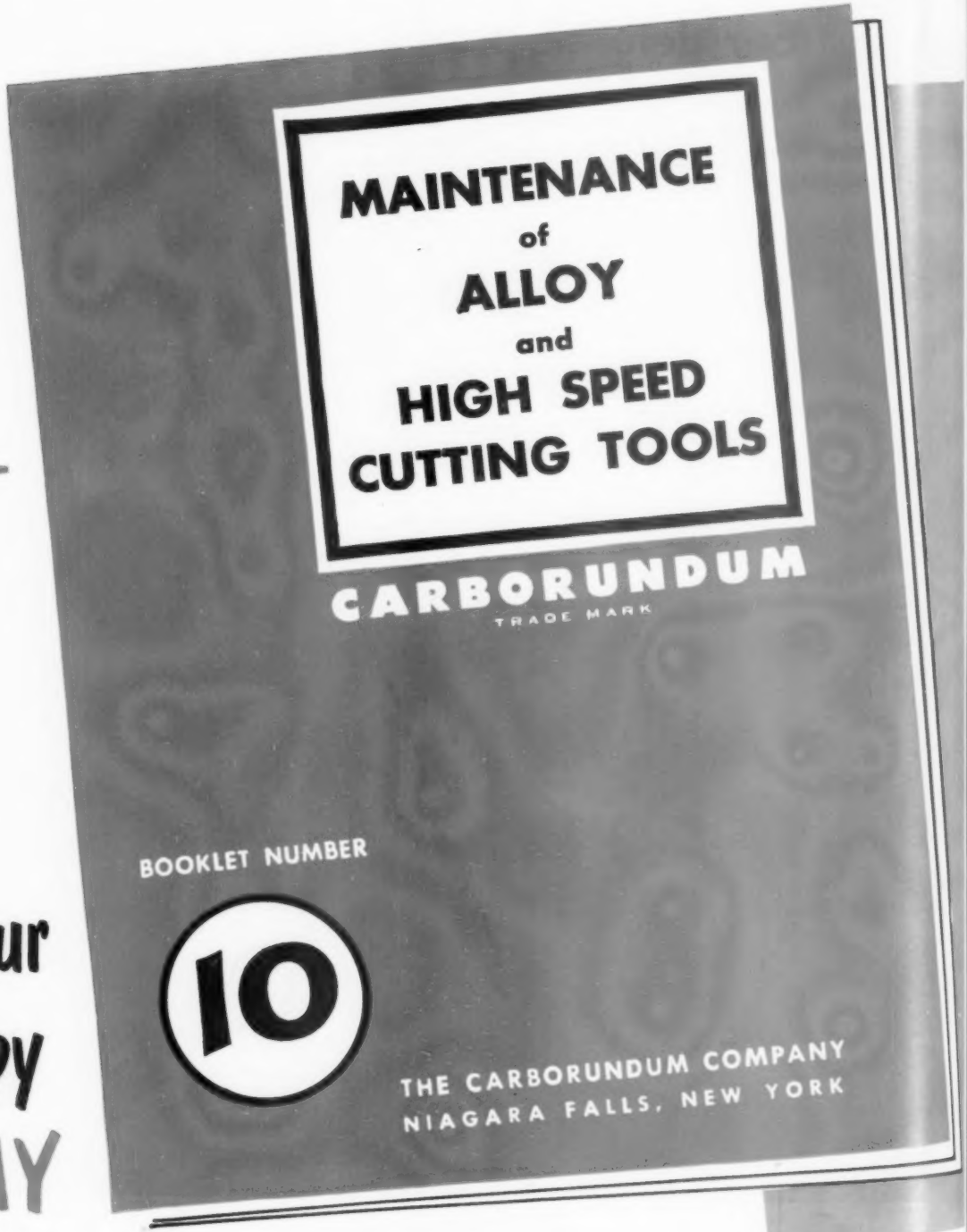

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how to get LONGER tool-life

72 FACT-PACKED PAGES

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Cutters and Reamers
- Grinding Methods
- Proper Clearance Angles

Typical Tool Sharpening Setups
- Spiral and Side Milling Cutters
- Large Face Mills
- Angular Cutters
- Formed Cutters—narrow and wide face
- Straight-toothed Hobs

Reamers

Thread Chasers

Drills, Taps, Broaches

Surface Grinding

Cylindrical Grinding

Internal Grinding

Lapping in the Tool Room

Grinding Wheel Grading Recommendations

HERE'S HELP IF YOU HAVE
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Changing methods
Defense contracts

BOOKLET NO. 10, newly revised, is crammed full of factual, easy-to-follow instructions for sharpening every kind of cutting tool. In addition to the subjects listed in the box, there are tables and diagrams on a wide variety of typical tools, showing the proper rake, clearance and cutting angle of each. Pocket-size, handy to use, clearly and profusely illustrated, a treasure-house of valuable information. Send for your copy today. Use the handy coupon (you can staple it to your letterhead or paste it on a postcard).

The Carborundum Company, Dept. TE 81-53
Niagara Falls, New York.

Gentlemen: Please send me—no obligation—a copy of your new Booklet No. 10—"Maintenance of Alloy and High Speed Cutting Tools."

NAME AND TITLE

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Also send me other publications, as checked off below:

- ☐ Causes and Correction of Common Grinding Errors
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The Steel Industry urgently needs Scrap that you may have!

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Dormant scrap isn't so easy to get moving because it usually requires someone in authority to say "That's no good to us any more. Let's get it out of here!" But there are an estimated several million tons of it available *now*, and thousands of steel mill representatives are calling on manufacturing plants nationwide to help dislodge it.

Because, we *need* it! The Steel Industry faces a serious current shortage of scrap, not to mention a continuing demand for at least 50% more scrap than in the peak year of World War II. ● Check whether *you* have any dormant scrap and sell it now!

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Production Pointers from GISHOLT

GISHOLT

TIME-SAVING IDEAS

Presented as a service to machine shops, we hope some of these interesting ideas, culled from thousands of jobs, will suggest ways to help you cut time and costs in your own metal work.

HOW TO DO SPHERICAL BORING WITH SPEED AND ACCURACY

Simplimatic Solves Problem with Special Pivoted Tool Slide

Generating a radius holds few problems when you give the job to the Simplimatic Automatic Lathe. Here's a case where 7 body styles and nearly 30 different sizes of housings and journals are handled on this one machine.

Planning for such a wide variety of parts calls for the use of three tooling slides.

Front Slide is cam operated and used for turning. This work is usually completed and slide retracted before boring begins.

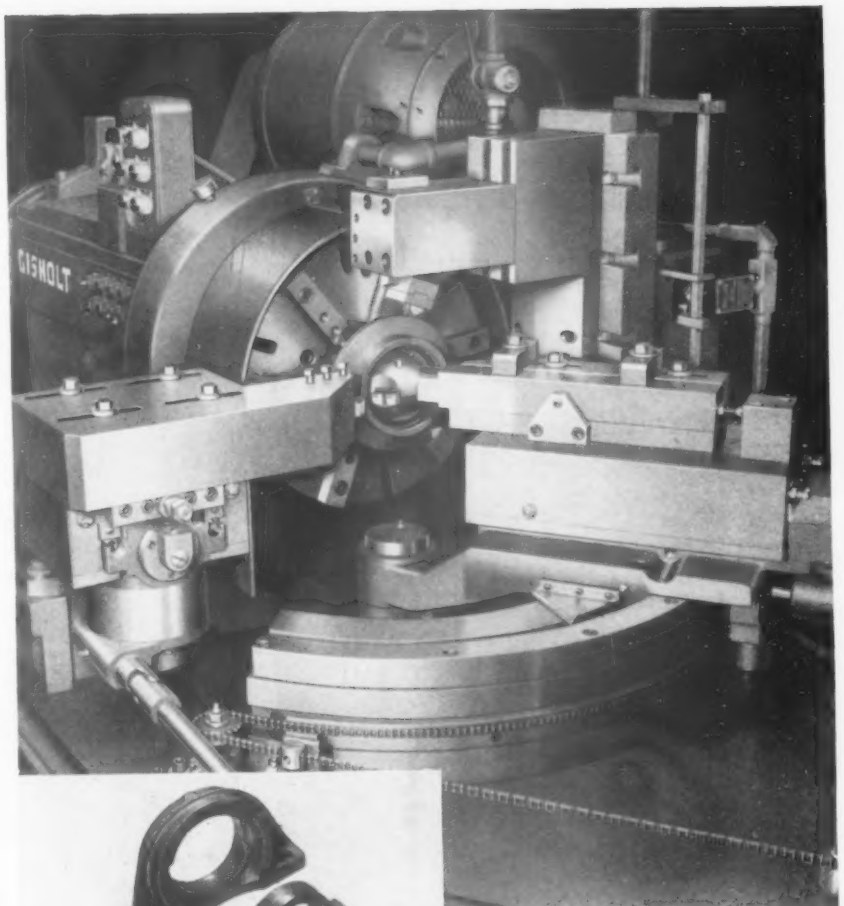
The Overhead Slide is hydraulically operated and handles facing and chamfering for both the body and the hub.

The Center Slide is used for all types of boring. This slide is mechanically driven and may be locked to provide straight or taper boring. When spherical boring is required, the slide base is pivoted and swings in an arc to generate the radius. The replaceable ball-head tool holder carries both rough and finishing tools which hold the radius to .0005" without further finishing.

As can be seen from the sample parts, the machine cycle can be quickly varied to suit the job. Once the machine is set up, the operator is needed only for unloading, loading and starting.

Floor to floor time varies with the different parts and sizes. But, an example of the high production output of this Simplimatic is the large cylindrical housings with a 7" spherical bore. These require only 3.9 minutes.

Special pivoted boring slide handles rough and finish cuts to generate radius while front and overhead slides turn and face other surfaces in single automatic cycle.



Close-up of the Simplimatic with pivoting center slide for spherical boring of journals and housings.

A few of the varied parts handled on this one machine.

RIGIDITY PAYS OFF ON JOBS LIKE THESE

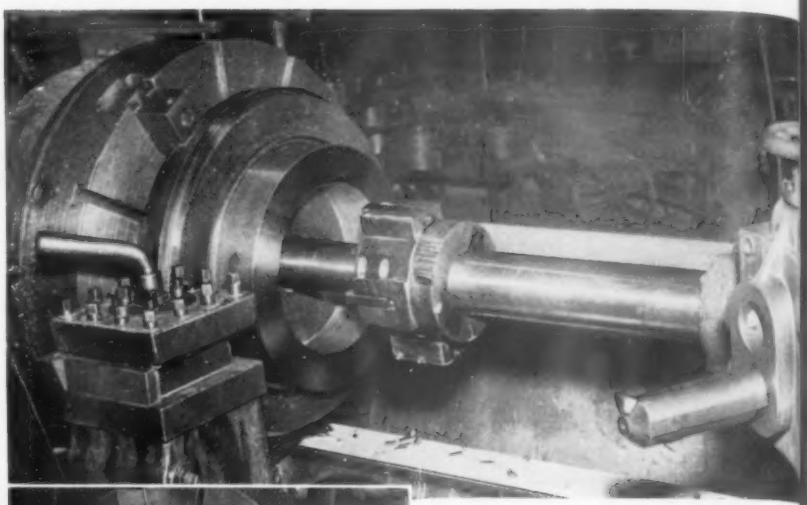
Turret Lathe Removes 300 lbs. of Metal from Solid Forging in 50 Minutes

These large parts are delivered to the turret lathe as solid steel Hyten B-4 forgings measuring 25 inches in diameter and 7 inches thick. Fifty minutes later they are finished spindle gear blanks—down in weight from 569 lbs. to 269 lbs.

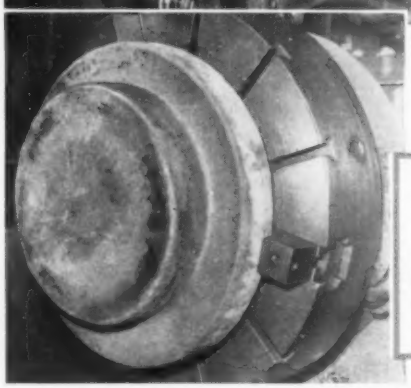
The job is duck soup for the 4L Saddle Type Turret Lathe with its 30 h.p. motor and great rigidity. A 3-jaw scroll chuck holds the part on the O.D. While the hexagon turret is pushing through the 4″ drill, the two outside diameters are being turned from the square turret.

Four staggered cutters on a piloted cathead then complete the boring while the O.D. is faced and chamfered from the square turret. Finally, the I.D. is chamfered by a slide tool on the hexagon turret.

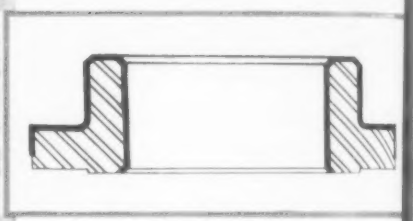
Steady production with such heavy cuts would not be possible but for the Gisholt's generous power and rugged, rigid design.



A picture of heft—it's in the large, heavy w… piece and the 4L Turret Lathe doing the jo…



The rough Hyten B-4 forging chucked and ready for hogging off 300 lbs. of metal.



The heavy lines show machining operati… finishing large spindle gear blanks.

TURRET LATHE FOR SMALL LOTS ON GEAR BLANKS

Single Setup Holds Tools for Both Operations

The No. 4 Ram Type Turret Lathe is used for these bevel gear blanks. The parts are made from Hyten B-4 bar stock sections.

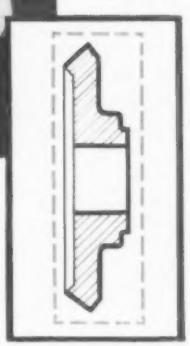
The first operation consists merely of finishing the bore, turning the p… angle and hub, along with facing a… chamfering. The parts are held i… 3-jaw scroll chuck, and the entire… is run through the first operation.

To get ready for the second ope… tion, it is only necessary to bore… soft chuck jaws to hold the part… the newly machined hub. The t… to complete the job are already… stalled on both the hexagon a… square turrets. It is now o… necessary to form the cou… bore and the front be… Floor-to-floor time for t… operations is less tha… minutes.

▲ Raw stock, piece after first operation, and finished gear blank.

◀ 1st operation: drilling from hexagon turret while finishing from square turret.

Heavy lines show bore and outside ▶ surfaces finished in two operations from solid bar stock section.



Single setup of turret l… tools handles two opera… on gear blank.

GISHOLT

TIME-SAVING IDEAS

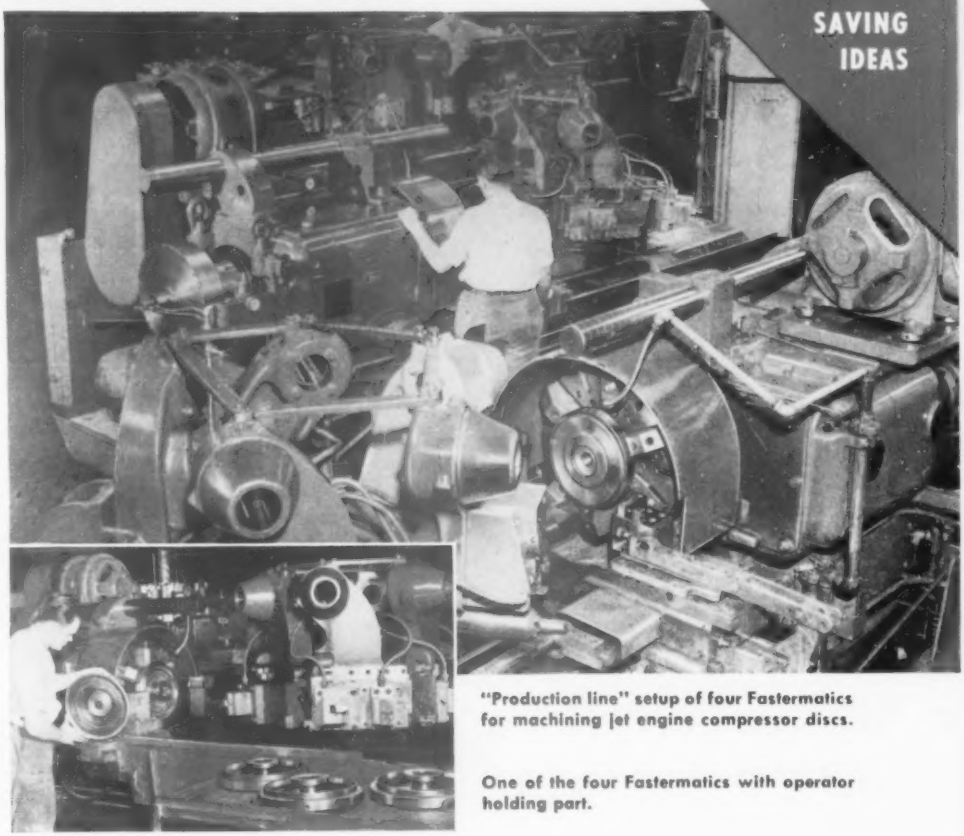
HIGH PRODUCTION SET-UP FOR DIFFICULT JET ENGINE PART

"Production Line" Method Calls for Four Fastermatics

This Compressor Disc is for the J-34 turbo-jet engine. Everything about it is tough from a machining standpoint. (1) It has a rather complicated shape. (2) Close tolerances must be maintained. (3) The material is stainless steel.

Here's the way production is set up: Four 4F Fastermatic Automatic Turret Lathes, arranged in convenient pairs for tending by two operators, perform all machining in four pass-along operations. These operations, and the time the job takes, are classified information—but it's no secret that Fastermatic Automatic Turret Lathes have the ability to hold close tolerances on the toughest work. And, because of the automatic operation of these machines, they multiply man power.

High-speed precision machining is achieved on difficult parts with successive operations handled on 4 Fastermatics. The flexibility of the Fastermatic assures ideal feed and speed for each cut.



"Production line" setup of four Fastermatics for machining jet engine compressor discs.

One of the four Fastermatics with operator holding part.

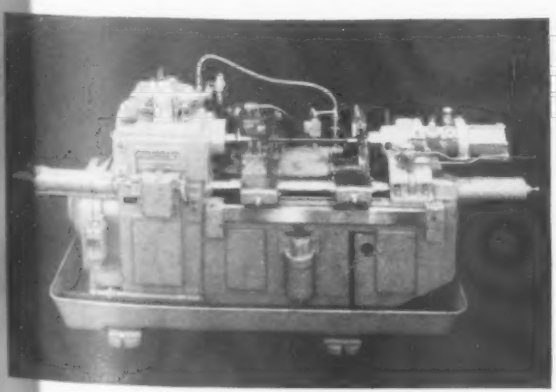
AUTOMATIC LATHE TOOLED TO MACHINE BOTH ENDS OF AXLES

All Machining Operations on No. 12 Hydraulic in One Chucking

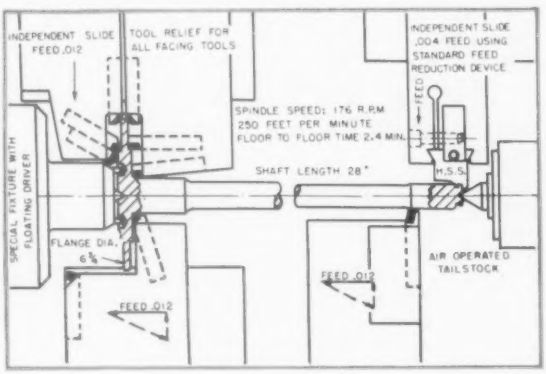
In order to machine both ends of these automobile rear axle shafts in one chucking, this Gisholt No. 12 Hydraulic Automatic Lathe is equipped with two front carriages and two rear cross slides—a set for each end. Machining begins with tools on the left front carriage turning the bearing diameter on the flange end. At the same time tools on the right front carriage turn the small diameter. Tools on the right rear slide then form the small end. Completing the job, tools on the left rear slide straddle the face and chamfer the flange.

The two carriages and slides show the adaptability of the No. 12 Hydraulic and the flexibility of its simple hydraulic circuit. Floor-to-floor time for the axle shafts is 2.4 minutes. Several types of axles are handled by the machine.

The addition of a front carriage and a rear slide to handle operations at both ends in one chucking, illustrates the ability of this versatile hydraulic machine to meet many unusual job requirements.



The No. 12 Hydraulic with special tooling for this axle job.


INDEPENDENT SLIDE FEED .012
TOOL RELIEF FOR ALL FACING TOOLS
INDEPENDENT SLIDE .004 FEED USING STANDARD FEED REDUCTION DEVICE
FEED
SPINDLE SPEED: 176 R.P.M. 250 FEET PER MINUTE FLOOR TO FLOOR TIME 2.4 MIN.
SHAFT LENGTH 28"
H.S.S.
SPECIAL FIXTURE WITH FLOATING DRIVER
FLANGE DIA. 6⅝
AIR OPERATED TAILSTOCK
FEED .012
FEED .012

Tool setup on No. 12 Hydraulic with extra front carriage and rear slide.

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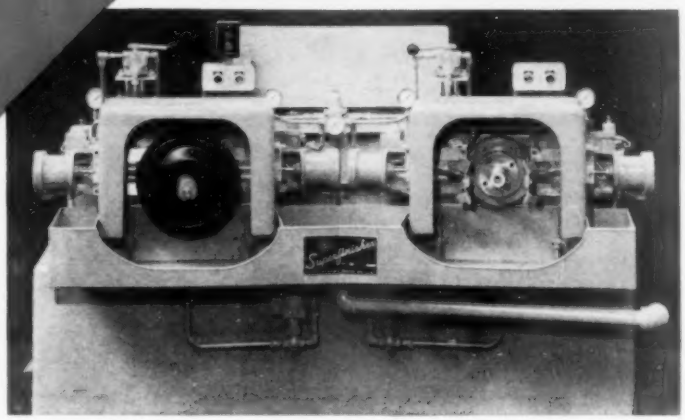
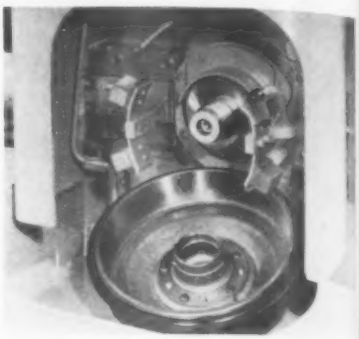
TIME-SAVING IDEAS

THESE BETTER BRAKE DRUMS COST LESS



This two-spindle Superfinisher turns out better brake drums at 5 a minute.



This close-up shows the two stoneholder assemblies which move horizontally. Drum oscillates as it rotates.

Three-Way Saving Through Superfinishing

Here's another manufacturer who has learned Superfinishing not only helps make a better product, but that it can cut costs as well.

Superfinishing these automobile brake drums is both fast and economical. Moreover, the resultant fine finish provides a superior braking surface because the area contact of the superfinishing stones removes the ridges left in turning—leaving a flat, uniformly smooth, better braking surface.

In operation, the two roughing stones (at right in close-up photo) make first contact with the rotating and oscillating drums for about 6 seconds. The finishing stones then work with the roughing stones for another 3 seconds. Finally, the roughing stones withdraw, and the finishing stones clean up the work for 6 seconds. The turned drums have a surface roughness of 150 micro inches RMS before Superfinishing. Afterward, surfaces measure 20 micro inches RMS. Production on this 2-spindle machine is five finished drums per minute.

With this Superfinisher, which has two spindles instead of one, there is also a saving in floor space. The arrangement more than doubles production because of the convenience and ease of loading and unloading.

Actually, this user benefits from superfinishing in 3 ways: (1) Cuts costs, (2) Achieves a better braking surface, (3) Saves floor space.

THE MODERN WAY TO MEASURE AND CORRECT UNBALANCE

Job Done on One Machine

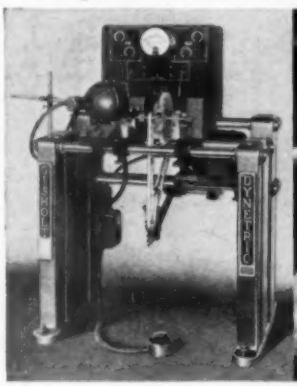
The balancing of rotating parts today follows a definite new trend: that of using a single machine for locating, measuring *and correcting* unbalance. Here's how it's done on fan motors and shafts by a simple, inexpensive set-up on a standard 1S Static Balancer.

The part is mounted in a supporting fixture which is free to vibrate in a horizontal frame. The part is then rotated, and unbalance readings are noted. Rotation is halted, and the part is turned to the proper angle for correction. A standard electric drill, mounted on the balancer support rods, is fed manually to drill to the proper correction depth as indicated by the meter reading and gauged by the drill depth indicator. A backing unit mounted to the left of the work piece takes up drill thrust.

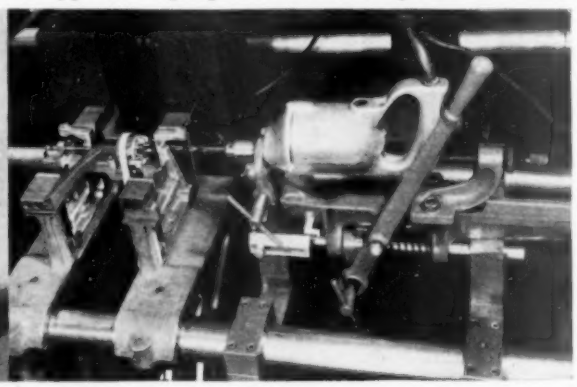
The part may now be rechecked to be sure proper correction has been made—without moving it to another machine or working station.

Write for copy of "Static and Dynamic Balancing," having latest information on balancing.

With correction equipment as part of the machine, operator can balance, correct and re-check each piece without removing it from its mounting. This reduces handling and speeds production.



The Standard 1S Balancing Machine.



A Standard 1S Static Balancer with drill for correcting small fan rotors and shafts.

Complete Courses in Balancing

As the world's largest builder of industrial balancing equipment, Gisholt conducts a complete school of balancing with courses in the theory and practical application of balancing to help with your problems. Here is training that is obtainable nowhere else. Write for details and starting dates.

The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

No. 252
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GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

Write for your copy of Gisholt's new general catalog.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

...OW MILNE CAN BRIGHTEN YOUR TOOL STEEL PICTURE

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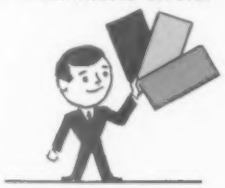

3 Hollow Die Steels with smooth finish inside and out, no scale, no decarb . . . minimize machining, reduce waste. Saw cut to length.

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America's Leading Tool Steel Specialists
Complete Line Of Tool Steels—Hollow and Solid

SAVE 2 WAYS with UNBRAKO SOCKET HEAD CAP SCREWS

1 TAP FEWER HOLES

It costs money to tap holes. You have to lay out, center punch, center drill, tap drill, body drill, counterbore, tap the hole, and insert the screw. The fewer holes you tap, the less the cost. *Three* UNBRAKO *screws will do the same job as five ordinary cap screws.*

2 USE SMALLER DIAMETER FASTENERS

Since a ⅜" UNBRAKO Socket Head Cap Screw is as strong as an ordinary carbon steel screw of ½" diameter, you save in weight and cost by using UNBRAKO. And because smaller diameter screws require less space, they permit more compact designs.

When designing, it pays to save with UNBRAKO! Write for descriptive literature. STANDARD PRESSED STEEL Co., Jenkintown 37, Pennsylvania.

UNBRAKO® SOCKET SCREW DIVISION

See us at the A.S.T.E. 20th Annual Convention, International Amphitheater, Chicago, Illinois, March 17 to 21, 1952.

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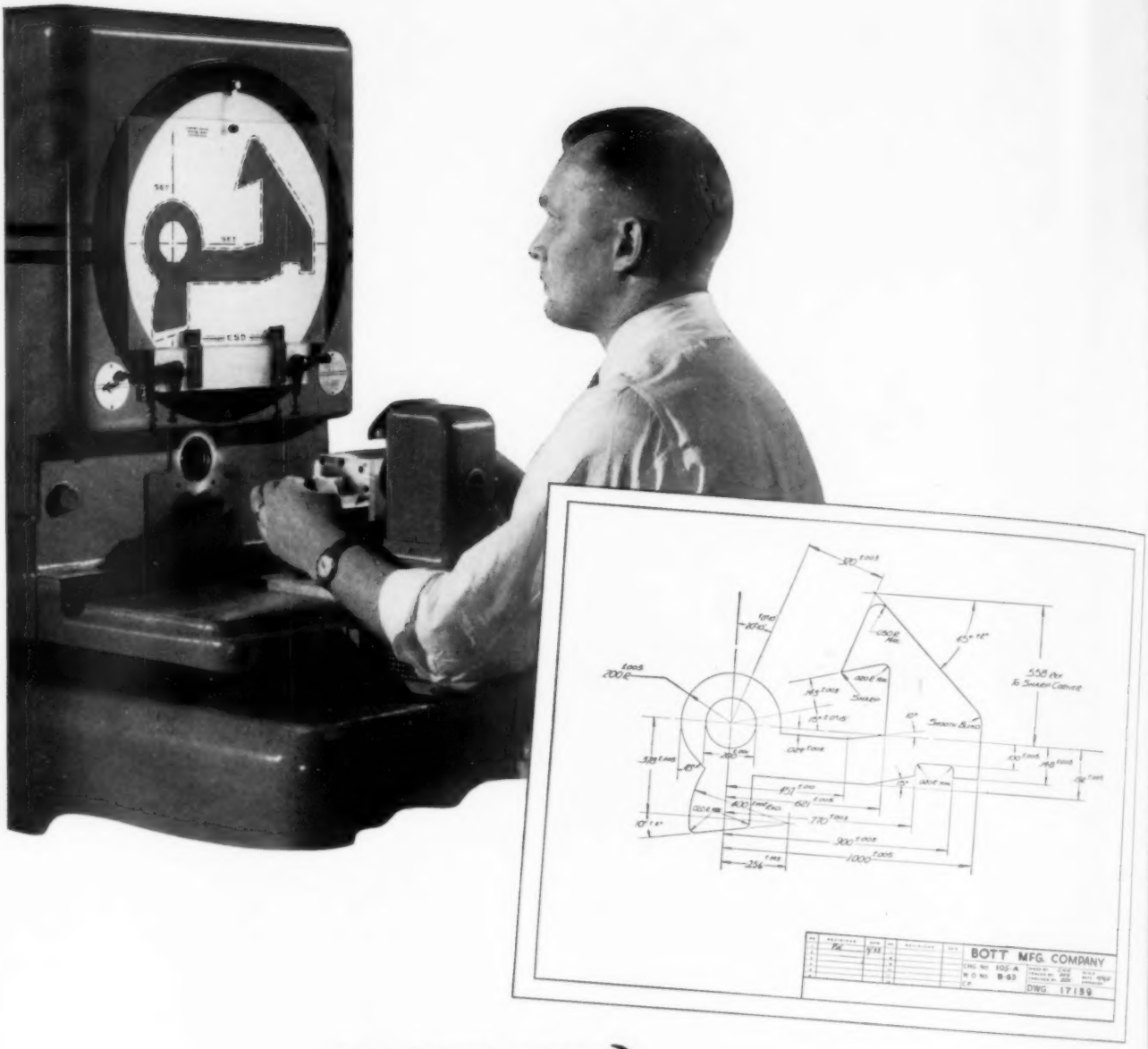
CAP SCREWS • SET SCREWS • SHOULDER SCREWS • DOWEL PINS • PRESSURE PLUGS



He checks 15 DIMENSIONS 8 RADII 7 ANGLES } in ONE operation

To check this part completely and accurately by usual methods, you might need as many as two dozen or more different gages—and you still wouldn't be sure all corners were sharp, all angles and radii exact. There's a much faster, more accurate way to do the job completely, one that requires no mechanical gages that can lose accuracy through wear.

On the Kodak Contour Projector, Model 3, you just slip the part into a holding fixture and compare its magnified image with a "chart-gage" over the bright screen. *Every* detail shown on the drawing is quickly and directly compared against the part itself, to close tolerances and in *one* operation. Little training or experience is required.

The part we show here is a relatively simple one for an optical comparator. With proper fixtures, charts, and accessories, you can measure all sorts of complex parts, large or small. Changes in specifications generally require nothing more than a corresponding change on the chart.

So overwhelmingly has industry turned to optical gaging that production of the Kodak Contour Projector, Model 3, the outstanding instrument for this method, has been greatly accelerated. Deliveries are rapid, and the cost of projector, fixture, chart-gages, and accessories usually comes below corresponding sets of mechanical gages. To get an idea of the large labor savings that the Kodak Contour Projector can bring to your inspection problems, get in touch with Eastman Kodak Company, Industrial Optical Sales Division, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

If you want to check precision spur and helical gears in action, write for information about Kodak Conju-Gage Instrumentation.

Kodak
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Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributors: Bethlehem Steel Export Corporation

Omega Tool Steel Outpunches Two Air-Hardening Grades

Our Omega tool steel took on two different air-hardening grades and outpunched them to win a unanimous decision. It all came about when one of our customers began the production of steel posts to be used for barbed wire entanglements by our armed forces. Made from re-rolled steel rails, the posts had to have several holes punched in them. We were asked to suggest a tool steel for this tough, cold-punching work.

It looked to us like a job for Omega, our silico-manganese grade that's tops for cold-battering and heavy shock work. The customer made up some punches from Omega and also some from two different air-hardening steels.

The production trial gave the customer a clear-cut result. The punches made from the air-hardening tool steels broke in less than eight hours. Those made from Omega needed only slight redressing after eight hours . . . in which time some 4000 posts were punched. Since then the Omega punches have stood up even better than the customer expected, saving steel and precious time.

There's nothing spectacular about this report. But it does illustrate the importance of starting with the right steel for the job.

Bethlehem tool steel specialists have the experience to help you get the most out of your tool steel, whether it's a problem of selection, tool design, machining, heat-treatment, or grinding.

Our Tool Steel Engineer Says:

Tool Steel Preheating Is Good Insurance

Steels having a hardening temperature above 1650 F should first be preheated at about 1200 to 1300 F. This shortens the heating time at the hardening temperature, helps to reduce excessive scaling and decarburization which occur rapidly at high temperatures.

Steels hardened above 2000 F should be preheated at about 1600 F.

8 TOOL STEELS for 90 PER CENT of ALL TOOL and DIE WORK

Reducing the number of tool steels you carry in stock simplifies tool room problems. It makes heat-treating easier and leads to lower costs.

Just eight mighty fine tool steels will handle 90 pct of all tool and die jobs:

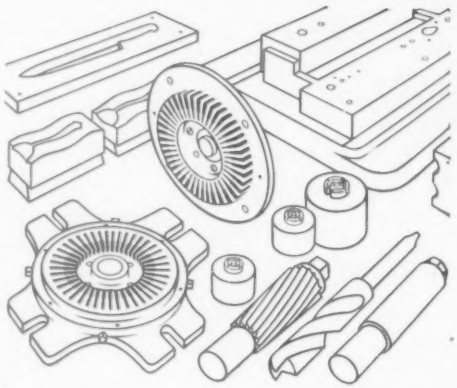
CARBON AND CARBON-VANADIUM For general-purpose tools. Water-hardening, it produces a tough core and a hard, wear-resisting case. Easiest to machine and heat-treat.

BTR Oil-hardening steel of the manganese-chromium-tungsten-vanadium type. For more intricate tools requiring safer hardening and less distortion.

A-H5 Our 5 pct chrome, air-hardening grade for greater protection against cracking . . . and for less distortion and better wear-resistance than BTR.

LEHIGH H High-carbon, high-chromium steel. An air-hardening grade, it's first choice wherever maximum wear and minimum distortion are important.

OMEGA For cold-battering tools. This silico-manganese steel combines hardness with maximum toughness for severe shock jobs on cold work.

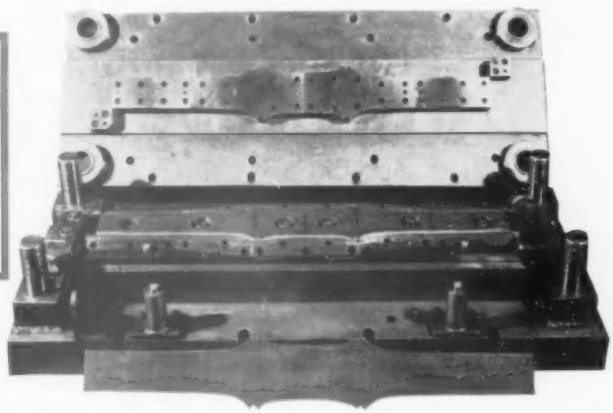


67 CHISEL Our chromium-tungsten grade for various shock tools and master hobs. When carburized for extra wear-resistance, it retains a hard, tough core.

CR-MO-W This 5-pct-chromium hot-work steel is ideal for jobs involving shock, drastic temperature changes, and where heat-checking is a problem.

66HS Today's most popular type of high-speed steel, this tungsten-moly grade is ideal for nearly all cutting tools. It's the AISI M2 type.

Big Blanks for Axle Housings

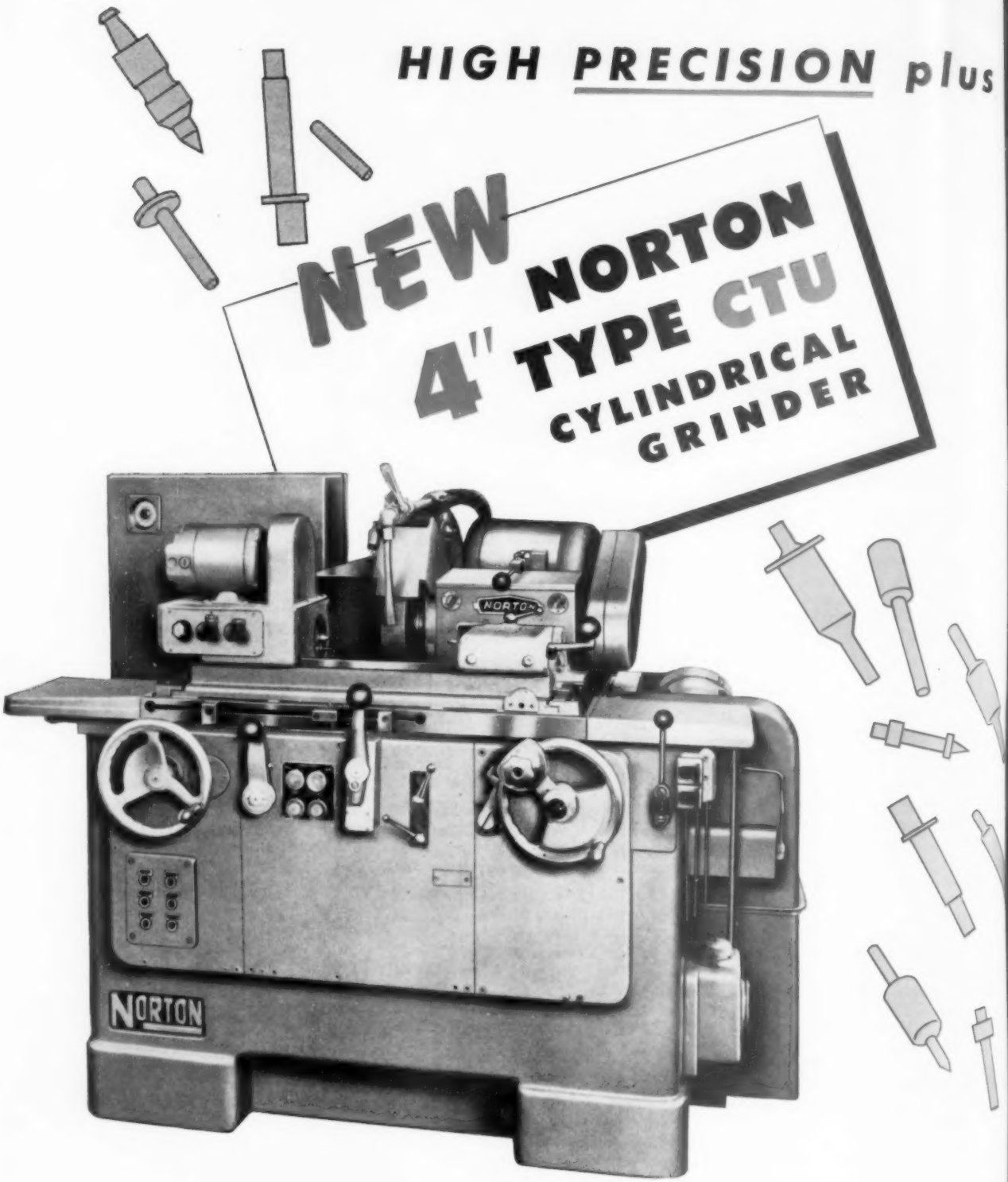


This die blanks out rear-axle housings from 3/16-in. sheet steel—3000 to 4000 per shift. Hardened to Rockwell C-61, the die needs only slight redressing after producing 50,000 pieces. Lehigh H, our air-hardening grade of high-carbon, high-chrome steel, is used because of its high wear-resistance and minimum distortion in heat-treatment. It's deep-hardening, ideal for heavy-duty dies.

Bethlehem ULTRASONIC TESTED **Tool Steel**

HIGH PRECISION plus

NEW NORTON 4" TYPE CTU CYLINDRICAL GRINDER



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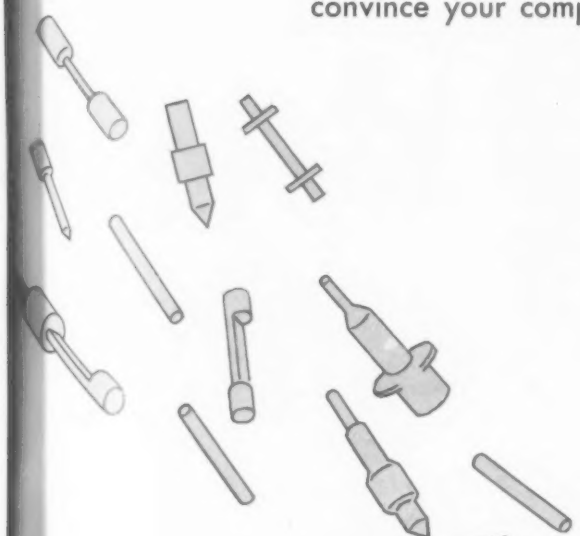

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Freedom from shut downs, long knife wear, efficient, accurate gauging and general ease of control all contribute to this steady production.

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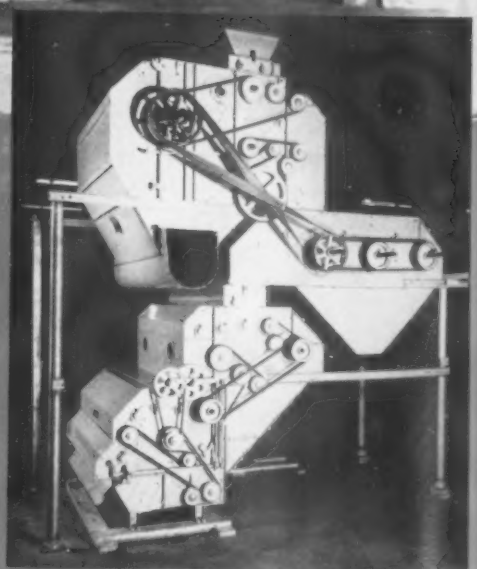

A John E. Mitchell Company combination machine used in cotton gins. Photos courtesy of the John E. Mitchell Company.

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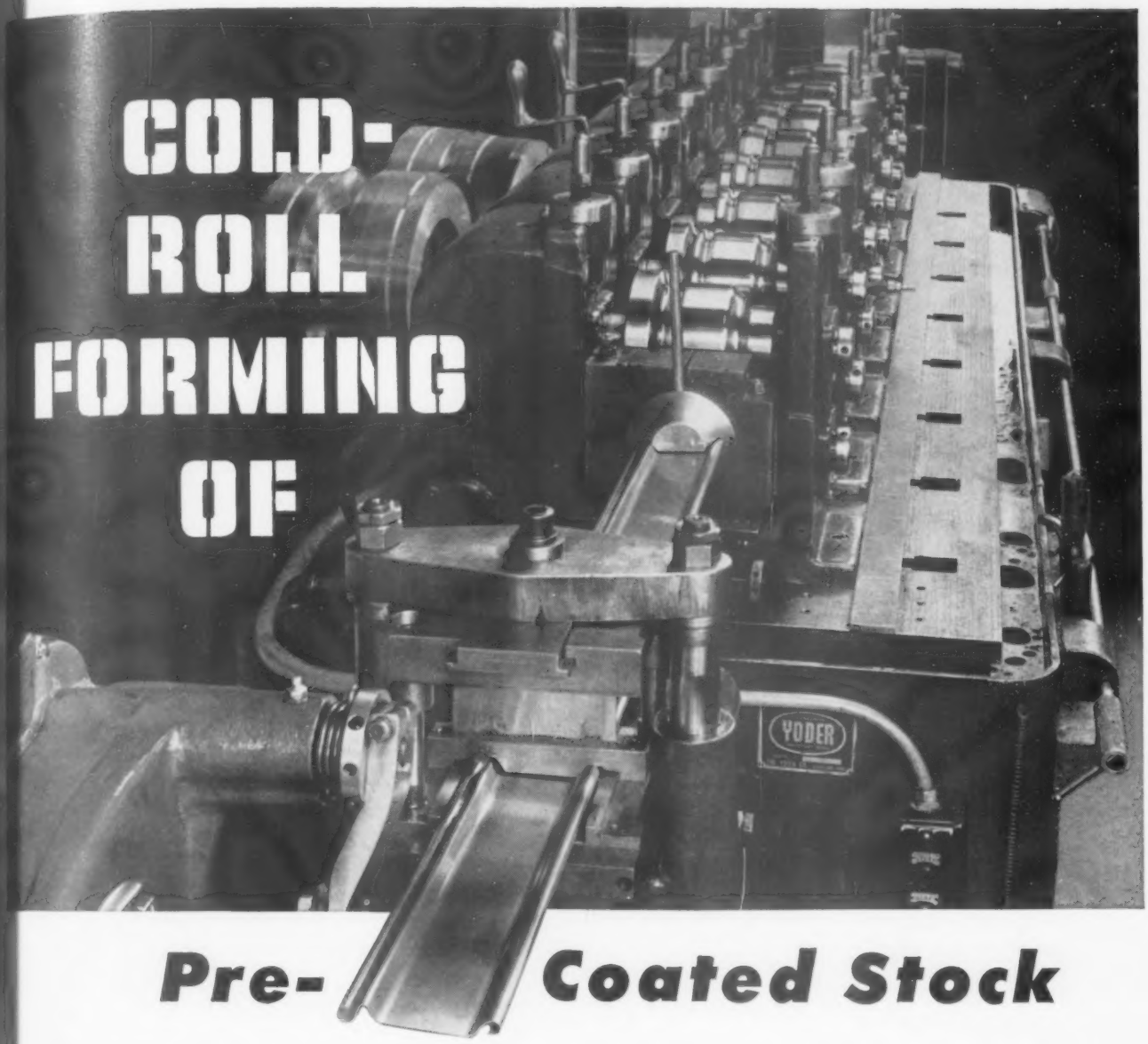

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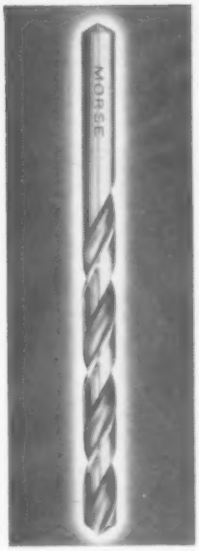

MORSE **Cotter Pin Drill.** Made with slightly heavier webs than General Purpose Drills. Able to withstand sudden torque and bending. For drilling sheet metal, cotter pin holes in shafting, and poor quality castings.

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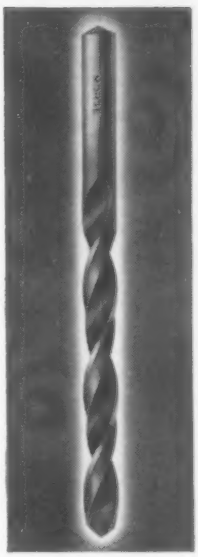
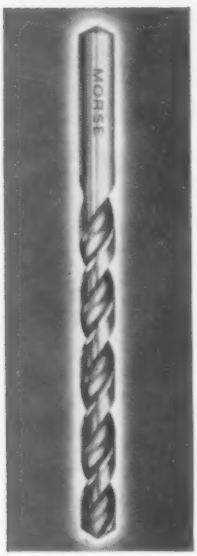
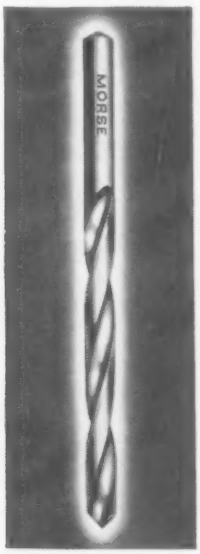
MORSE **Brass Drill.** Specially constructed with slow spirals; wide, polished grooves and a slightly lower temper for use in soft, non-ferrous metals of the brass family.



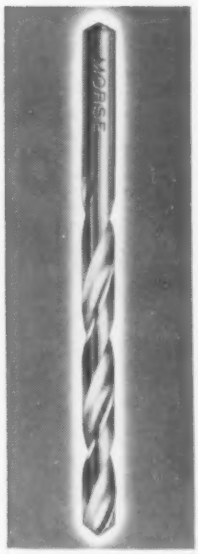
MORSE **Heavy Duty Drill.** Made with heavy webs for greater rigidity for use in power-fed equipment. Used in stainless or spring steels, hard cast-iron, monel, and heat-treated metals, near the limit of machinability.



MORSE **Quick Twist Drill.** Made with a fast spiral and polished flutes for use in aluminum, magnesium and die-cast materials of low tensile strength.



MORSE **Plastics Drill.** Similar to Brass Drill but with 90 degree points and a special heat treatment to resist abrasion found in drilling bakelite, hard rubber and many molded plastics.



MORSE **Ground Flute Ambore Drill.** Ground - from - the - solid in the smaller sizes; with polished flutes in the larger. All made with the special Ambore heat treatment for maximum toughness.

MORSE
Cutting Tools

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Production News

ABOUT *Lusol*.. —THE ALL-CHEMICAL METAL-WORKING SOLUTION

FROM F. E. ANDERSON OIL COMPANY · PORTLAND, CONNECTICUT

Plants are increasing their *Make* with this *Fluid* Production Tool

Same manpower . . . same machines "Lusol is doing for production in the 50's what carbide tools did in the 40's," comments one works manager. He is getting greater speeds and feeds with Lusol all-chemical metalworking solution, yet cutting tools last longer. Grinders are removing more metal and finishes are finer, yet wheels run many times longer between dressings.

Lusol outproduces anything we've ever seen before, is the report by management men and machine operators in plants all over the country. Men like to work with Lusol; it is clean and keeps their machines clean. To let you prove these facts in your own plant, we'll gladly *give* you the Lusol you need for the test.

". . . and the chips ran white!" exclaims a process engineer who was "just trying to see how much we could hog out with Lusol."

★

"Who makes Lusol?"

That question has been asked so often that we realize this bit of history should be told:

Lusol is made by F. E. Anderson Oil Company, for 17 years producers of nationally known, Government approved rust preventives, lubricating oils and greases, metal working and hydraulic oils, and cleaners. Lusol itself has a background of 7 years of developing, proving and use. Lusol representatives and service engineers are old hands at the business. You can depend on their recommendations and on the consistently high quality of Lusol.

users say*

case histories of Lusol at work

FASTENER MANUFACTURER —"Get a 45% improvement in the saw life of our slotters with Lusol. Screws used to come out smoking hot; now cool, explaining our longer cutter life with Lusol."

A FORGING SHOP—"Operate eleven hacksaws for cutting off bars and billets as forging blanks. No comparisons on production, as they use so many different steels, but all shop men agree that Lusol is doing a much better job. No trouble any more with odors or dermatitis."

A BRASS COMPANY—"Rolls formerly picked up metal particles, causing pitting and ultimate breakage of the rolls. Since the adoption of Lusol, no new rolls have been broken and there has been no pickup of brass by the steel rolls. Temperature of the rolling solution has been lowered an average of 10° F."

(* Case histories of Lusol at work)

FREE BOOK

Get complete facts about Lusol by writing for this 20-page booklet. It contains information on machine cleaning, maintenance of Lusol solutions, elimination of dermatitis and odor in machines, plus many case histories of Lusol at work. Write F. E. Anderson Oil Company, 213B, Portland, Conn.

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THE TOOL ENGINEER
Publication of The American Society of Tool Engineers

The Tool Engineer

a Letter from the Editor...

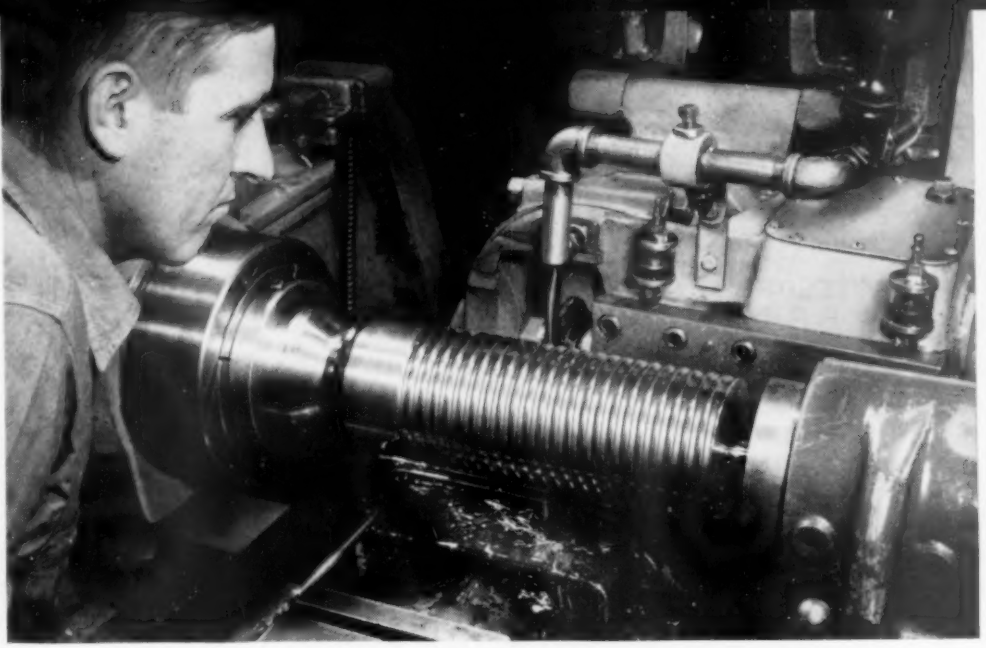
Over the past couple of years a number of stories have appeared in *The Tool Engineer* which described the scholarship award programs developed by a constantly-increasing list of ASTE chapters. A variety of methods have been evolved to finance these college tuition awards, and some of the plans involve a substantial contribution to the education of future tool engineers.

This trend is commendable. Far more than that, it is a recognition on the part of actively-thinking members of our Society that the future of the tool engineering profession, and therefore of our Society, depends on the recruiting and training of college graduates, and the further training of these graduates to the level of qualified tool engineers.

Our Society has had, in common with all new engineering professions, somewhat of an uphill drive to obtain full academic recognition in the form of a degree in tool engineering. Recent *Tool Engineer* articles have indicated that the drive is meeting success; as the profession expands so will wider academic recognition in the future.

Meanwhile, what better proof of the demand for tool engineers educated as tool engineers can we provide to academicians than national and chapter encouragement—financial in some cases—to students interested in tool engineering as a future? As a reminder of a point we sometimes do not consider—even universities operate on the law of supply and demand.

Gilbert P. Muir



THREAD MILLING A SCREW. Metal: SAE 2345 steel heat-treated to 28 Rockwell • Machine: Lees Bradner thread miller • Part: 5¼" adjusting screw for press brake • Operations: rough and finish thread milling Tool: high-speed steel • Feed: 0.260 depth on roughing Cutting Oil: Sunicut 105

BROACHING A GEAR KEY-WA Metal: SAE 2345 steel forging 220 Br nell • Machine: 3L8 La Pointe hydra broach • Part: gears for shaper, p duced two at a time • Tool: 3' high-sp steel broach • Cutting Oil: Sunicut

SUNICUT 105 REPLACES THREE OILS AND SOLVES FIVE MAJOR PROBLEMS

Buying three cutting oils and then blending them to make additional grades had proved highly unsatisfactory to a machine tool builder. The smoke was noxious, employees complained of skin irritations, the color of the oils made it difficult to see the work, tool life was short and finishes not up to standard. To help solve these problems, the company called in a Sun representative and on his advice tested Sunicut 105 on the three tough jobs pictured here.

So good were the results that the company adopted Sunicut 105 for every machine in the plant and has used it exclusively for the past two years. The operators like its transparency. There are no complaints about smoke or skin irritations. Finishes have improved and tool life increased as much as 50 percent.

For complete information on Sun's cutting oils, write to Department TE-2 and we will send you a copy of our informative, illustrated booklet "Cutting and Grinding Facts."

CUTTING A LARGE GEAR. Metal: bronze 180 Brinnell • Machine: Gould & Eberhardt gear hobbing machine • Part: main drive worm gear wheel for large shear • 42⅝" O. D.; 5" thick; 87 teeth • Tool: high-speed steel hob • Feed: 0.006 • Speed: 42 rpm • Cutting Oil: Sunicut 105

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The Tool Engineer

Editorial

Tools for the Tool Engineer

The largest exposition in ASTE's history combined with the most widespread technical program ever presented at an ASTE Annual Meeting are dedicated next month to tooling for security. The importance of the tool engineer at this vital stage of our defense effort cannot be overestimated; over forty technical speakers and almost ten times that number of exhibitors are joining efforts to provide him with the latest information on high-production tooling.

A major departure at the Twentieth Annual Meeting is the establishment of five feature days devoted to five basic phases of tool engineering: quality control and inspection; metal cutting; materials forming; grinding and finishing; and machine accessories, drives and controls. The technical papers and panel discussions scheduled for each of these days during the convention and exposition assure intensive coverage of specific problems for the benefit of tool engineers looking for new and better solutions.

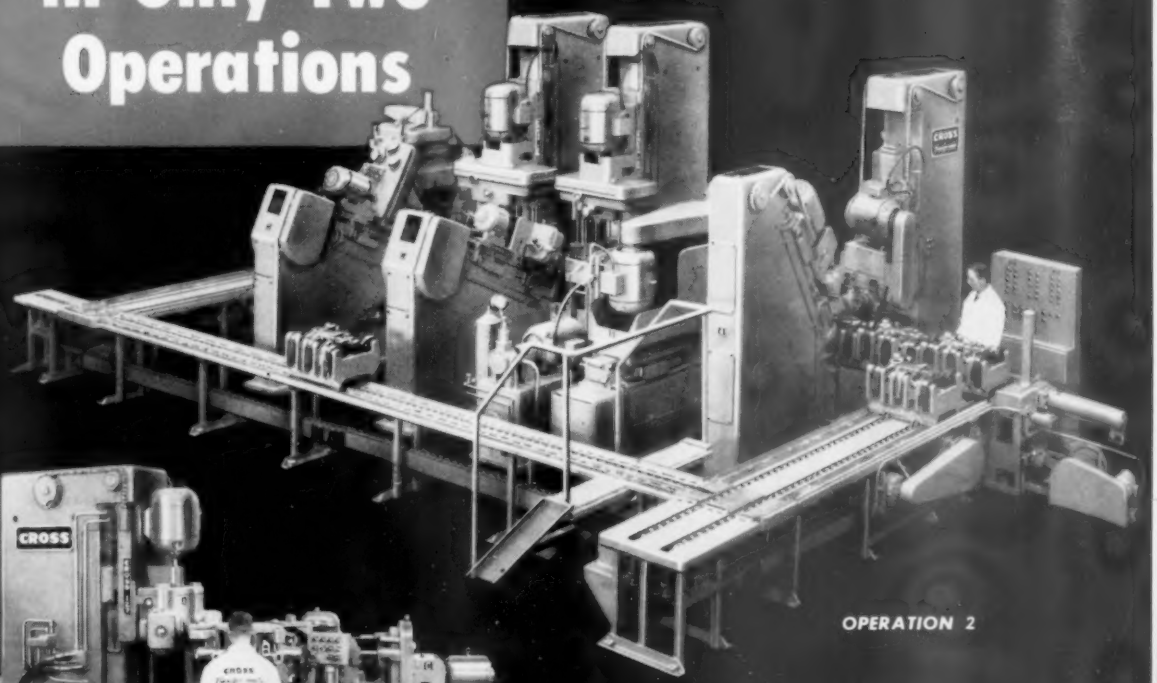
Exhibitors at the exposition, numbering almost 400, represent a tremendous volume of tooling design, know-how and experience which can be applied to high-level tool engineering. Their engineering and production contributions are particularly valuable, obviously, in a guns-and-butter economy such as we have at present. In this connection, it is unfortunate that even with the large amount of space contained in Chicago's International Amphitheatre, ASTE's Exposition Committee was forced to decline the applications of a substantial number of would-be exhibitors because of lack of space to accommodate them.

J. Demuth

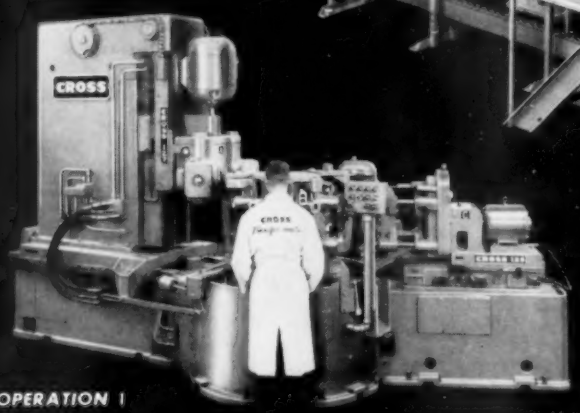
PRESIDENT
1951-1952

Intake Manifolds in Only Two Operations

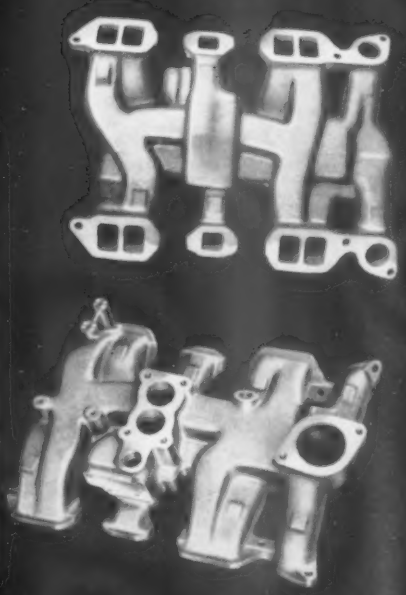
More Specials by Cross



OPERATION 2



OPERATION 1



- ★ Operation 1: Mill angular mounting pads and drill mounting holes.
- ★ Operation 2: Mill choke pad, carburetor pad and water pipe connection; bore water hole and carburetor holes; drill, chamfer, ream and tap all other holes.
- ★ 50 pieces per hour at 100% efficiency.
- ★ J.I.C. standard construction; stranded wire electrical installation; automatic chip disposal; preset tools and Toolometers to reduce downtime and speed tool changes.

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Special MACHINE TOOLS

Milling Product Analysis and Equipment Selection

By Earl P. Leeds
BROWN & SHARPE MANUFACTURING COMPANY

MILLING IS SAID to be the art of removing metal with a rotary cutter. Broadly speaking, this art should be engaged in only when it is the most profitable solution to a problem.

The first factor to be considered when solving a production problem is to determine whether or not there is a necessity for removing metal. Should the product be forged, drawn, stamped or formed, or produced by some similar methods? Will one of these methods provide the necessary tolerances, finish or physical characteristics? The answers to these questions quickly point out the proper procedure. If it must be machined, the product will fall in one or more of the basic machining classifications; that is, milling, boring, turning, planing, grinding, or a modification of one of these types of metal cutting.

The shape of the surface to be machined, its size, the finish and the quantity required largely determine the manufacturing process for a given product as well as the type of equipment to use in its manufacture. If the product is to be machined by milling, the selection of the machine tool equipment, fixtures, cutters, arbors, etc., can readily be made by one having a good knowledge of the fundamentals of proper milling practice.

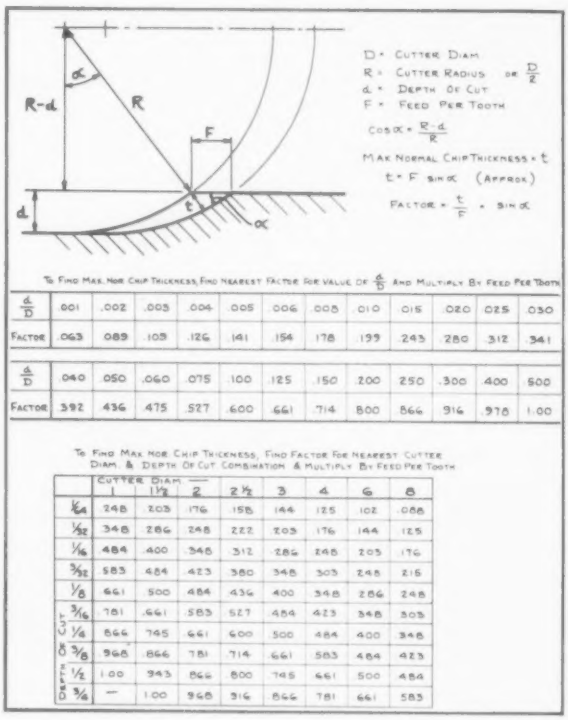
Adherence to fundamentals—computing horsepower, selecting feeds, speeds, and proper cutters—plus ingenuity in their application, is the springboard to improved milling. Improved milling means a better product or the further reduction in cost of a satisfactory product.

Milling machine design engineers are directing their efforts to providing sufficient physical capacity, horsepower and other refinements such as ease of handling, sufficient coolant, etc., so that these basic fundamentals can be applied effectively.

The fundamental factors which contribute to lower costs are easily mastered. Because of their relationship, neglect of one will seriously jeopardize the success of any project. Close attention to good milling practice in the selection of a milling machine will contribute to greater efficiency in the production of this work. The required horsepower can be ascertained when the following factors are known: size of work, amount of stock to be removed, and material.

In the past the determination of the required horsepower to remove metal has not been of too great importance because other conditions, such as chatter, limited the cut and protected machine motors. Modern milling machines are capable of taking full overload cuts without making the rafters ring. Today, with wider use of improved cutting materials, such as carbides, cast alloys, etc., it is essential that particular attention be paid to power required to remove metal. For estimating purposes, it is known that one horsepower is required

Fig. 1. The maximum normal chip thickness can be found by determining the factor for the cutter diameter—depth of cut ratio and multiplying by the feed per tooth.



To Find Max. Nor. Chip Thickness, Find Nearest Factor For Value Of d/D And Multiply By Feed Per Tooth

d/D	.001	.002	.003	.004	.005	.006	.008	.010	.015	.020	.025	.030
Factor	.063	.089	.109	.126	.141	.154	.178	.199	.243	.280	.312	.341

d/D	.040	.050	.060	.075	.100	.125	.150	.200	.250	.300	.400	.500
Factor	.392	.436	.475	.527	.600	.661	.714	.800	.866	.916	.978	1.00

To Find Max. Nor. Chip Thickness, Find Factor For Nearest Cutter Diam. & Depth Of Cut Combination & Multiply By Feed Per Tooth

Cutter Diam. / Depth of Cut	1	1½	2	2½	3	4	6	8
1/64	.248	.203	.176	.158	.144	.125	.102	.088
1/32	.348	.286	.248	.222	.203	.176	.144	.125
1/16	.484	.400	.348	.312	.286	.248	.203	.176
3/32	.583	.484	.423	.380	.348	.303	.248	.215
1/8	.661	.500	.484	.436	.400	.348	.286	.248
3/16	.781	.661	.583	.527	.484	.423	.348	.303
1/4	.866	.745	.661	.600	.500	.484	.400	.348
3/8	.968	.866	.781	.714	.661	.583	.484	.423
1/2	1.00	.943	.866	.800	.745	.661	.500	.484
3/4	—	1.00	.968	.916	.866	.781	.661	.583

Cutter Diam. / Depth of Cut

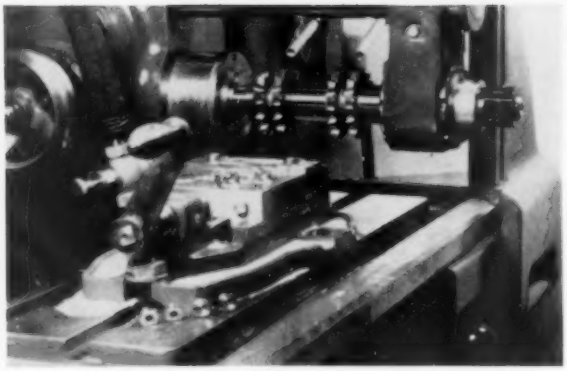


Fig. 2. Double flats are high-speed milled on two SAE x 112 studs at once with four 14-tooth staggered-tooth side milling cutters. Normally flats would be milled at 80 to 90 fpm and 5 ipm feed. Here the cutters operate at 365 rpm, 238 fpm with 24⅜ ipm feed.

to remove one cubic inch of mild steel per minute, one-half horsepower to remove one cubic inch of cast iron per minute, and one-third horsepower to remove a cubic inch of aluminum. These relationships provide a good basis of evaluation for a proposed milling cut. A cut will seldom be found which requires less horsepower than given by these calculations.

There are, however, cuts which require more horsepower, especially where cutters drag in the cut or where they remove fine chips. Fine tooth cutters, saws in narrow slots and half-round form cutters are in a class that consume more horsepower. A more accurate horsepower computation can be obtained by taking other factors into consideration, such as cutter angles, number of teeth that come in contact with the workpiece at one time, amount of power actually delivered at the machine spindle, the hardness of the material, the length of cut, etc., but in general the suggested values are an excellent guide to proper machine selection. The cubic amount of stock removal is calculated using the formula: width of cut times depth of cut times the feed in inches per minute.

Obviously, the feed rate is a variable factor. This can be determined by the number of cutter teeth coming in contact with the work per minute times the advance per tooth. The advance per tooth is commonly called "chip load." See Fig. 1.

The number of teeth coming in contact with the work is governed by the allowable surface speed of the cutter. The proper feet per minute of the cutter is determined by the cutter material, material being machined, or in some instances better means of cooling the cutter. See Fig. 2.

The chip load is controlled in most cases by the strength of the milling cutter tooth, the number of teeth in contact with the work and clearance in the workpiece or cutter. This latter provides easy clearance for the chips. We know that a chip load of 0.00025 in. is reasonable for an 0.008-in. wide saw and an 0.010-in. chip load is conservative for a helical milling cutter. See Table I. The chip starts at 0 and increases to its maximum thickness in conventional milling. When milling on center, the chip load is equal to the advance of the table per tooth, but the chip load becomes less as the depth of cut is decreased, as in Fig. 1.

Table I—Chip Per Tooth for a Busy Cutter in Machinery Steel SAE 102D

Type of Cutter	Cutter size	Chip per tooth
Saws	0.008 Wide	0.00025
	1/32 Wide	0.0005
	1/16 Wide	0.001
	1/8 Wide	0.002
End Mills	1/4 Diam.	0.001
	1/2 Diam.	0.002
	3/4 Diam.	0.003
Staggered Tooth Side Mills		0.005 to 0.008
Coarse Tooth Cutters		0.005 to 0.008
Helical Mills		0.010 to 0.012
Face Mills		0.010 to 0.020

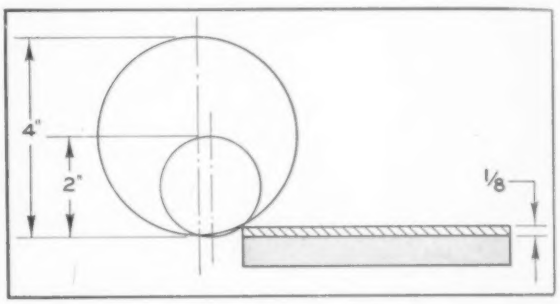


Fig. 3. At a three-in. feed rate, the smaller cutter saves about four seconds per piece in run-in time alone. At a given finish, the small diameter saves 50 percent of the cutting time over the larger cutter. Where the larger cutter must be used, the use of two-speed feed motors reduces run-in time.

Proper selection of milling cutters contributes greatly to milling efficiency. The following three rules should be kept in mind in selecting cutters: First, use cutters having few teeth; use cutters of small diameter; use cutters with steep spiral angles. Cutters with few teeth and steep spiral angles permit rapid stock removal. Small cutters run faster than large ones at a given surface speed. Therefore, at a given finish they will mill faster. They also require less run-in time. See Fig. 3. Care should be taken to be sure that arbors and cutter sizes are not reduced to the point where they become so frail that they are not practical to use.

In milling with a cylindrical cutter on a horizontal machine the smoothness of the surface depends on the true running of the milling cutter. A certain amount of eccentricity cannot, of course, be avoided, but should be held within 0.002 in. Deep marks or flutes are left on the surface when milling with eccentric cylindrical cutters. These marks are

repeated with each revolution of the cutter and their depth is proportional to the eccentricity.

While eccentricity of face milling cutters has no adverse effect, face runout should be kept to a minimum. If revolution marks have a coarse pitch, the scalloped effect is quite noticeable. If the pitch is $\frac{1}{32}$ or less, then the effect is small and the finish is described as fine. The finish produced in climb milling may be better or worse than regular milling. In soft material the climb milling finish is dull, and has a torn appearance, whereas conventional milling gives a shiny surface. There is probably little difference in the accuracy or soundness of the surface, but if no further operations are to follow, the conventionally milled surface would be selected in preference to the climb milled surface.

Cutters having high undercut of about 25 degrees rake angle improve the appearance of surfaces on soft ductile materials when climb milled. It is particularly desirable to use this type of cutter if the workpiece is difficult to hold due to the peculiarities of its shape. However, since high rake cutters are generally special, this solution is not commonly used. When high carbon steels or high speed steels are considered, the situation is reversed. Climb milling produces a better finish than a conventional milled surface. The climb milled surface is a dull, clean surface. The conventionally milled surface is shiny but may be streaked and may show marks where chips were carried through a second time by the cutter. An example of this is shown in Fig. 4 where two flutes have been milled in high speed steel under identical conditions, one a climb cut, the other a conventional cut.

Of course, another factor which perhaps can be treated as part of the finish problem is that climb milling often eliminates burrs and fins, for these are generally carried down by the cutter, where in regular milling they would be pushed up along the side as the cutter teeth break through. This means burring operations can often be eliminated or made

Fig. 4. The flute finishes shown here were obtained by using climb and conventional milling in high-speed steel. Note the absence of burrs and the better finish in the flute at left.

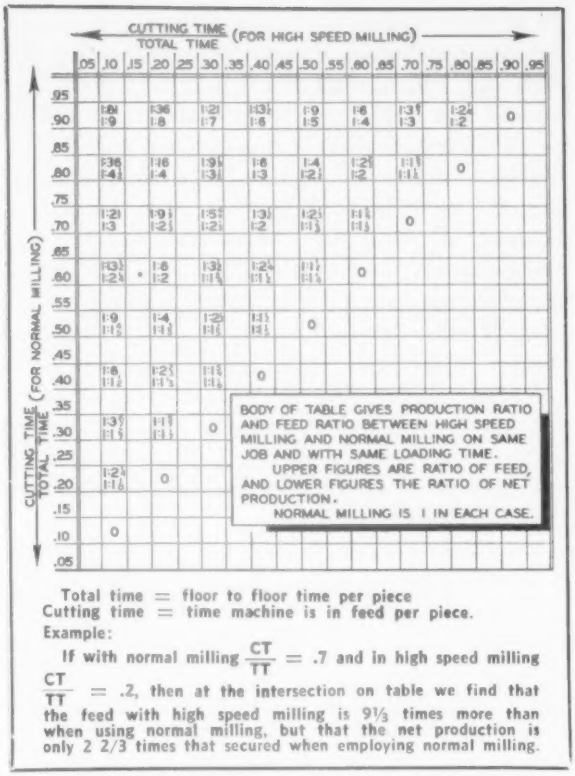

CUTTING TIME (FOR HIGH SPEED MILLING)
TOTAL TIME
.05 .10 .15 .20 .25 .30 .35 .40 .45 .50 .55 .60 .65 .70 .75 .80 .85 .90 .95
CUTTING TIME (FOR NORMAL MILLING)
TOTAL TIME
BODY OF TABLE GIVES PRODUCTION RATIO AND FEED RATIO BETWEEN HIGH SPEED MILLING AND NORMAL MILLING ON SAME JOB AND WITH SAME LOADING TIME.
UPPER FIGURES ARE RATIO OF FEED, AND LOWER FIGURES THE RATIO OF NET PRODUCTION.
NORMAL MILLING IS 1 IN EACH CASE.
Total time = floor to floor time per piece
Cutting time = time machine is in feed per piece.
Example:
If with normal milling $\frac{CT}{TT}$ = .7 and in high speed milling $\frac{CT}{TT}$ = .2, then at the intersection on table we find that the feed with high speed milling is 9⅓ times more than when using normal milling, but that the net production is only 2 2/3 times that secured when employing normal milling.

Fig. 5. Production ratio (upper figure) and feed ratio (lower figure) between high-speed milling and normal milling on the same job, with the same loading time. Normal milling is 1 in each case. Total time is floor-to-floor time per piece. Cutting time is the time the machine is in feed.

easier by adopting climb milling. The order of manufacturing operation can frequently be changed to facilitate more economical milling. As a word of caution, it should be ascertained that the machine is arranged with a device to permit climb cutting, since it is necessary to eliminate play or motion between the feed screw and nut.

It is not superfluous to say that all types of cutters should be properly maintained. Cutter grinding is a subject in itself. The foregoing fundamentals can be applied to all milling work with the aim of faster machining as the ultimate goal. These faster rates do not always reflect the best over-all economical conditions. Higher speeds and feeds are daily being used and constant effort is exerted to obtain optimum rates. Continued efforts should be made to increase machining efficiency. It is essential that the cutting time and loading time be considered together, since the time to complete a unit is the sum of the loading time, cutting time, and unloading time.

The chart in Fig. 5 shows typical time cycles. Note that even though the machining time is reduced considerably, this reduction in relation to the floor-to-floor time is relatively small. Reducing the loading time presents a real challenge to engineers. Little is to be gained by shortening the cutting time if the machine must stand idle while

the next piece of work is being loaded.

In the application of special fixtures, holding devices and other accessories to standard machines, over-all cost of the equipment which is reflected in the unit cost of the part is of paramount importance. Within the framework of total allowable equipment cost, the speed of loading is all important. It is assumed, of course, that other requirements of the part are met in a satisfactory manner. Fig. 6 shows one of the simplest types of fixtures which it is economical to use because of the low initial cost. Block fixtures of the type shown are loaded while parts are being milled in a second block in the machine or holding device. The loading time, as far as machines are concerned, is only the time required to remove one block from the vise and to insert and clamp another.

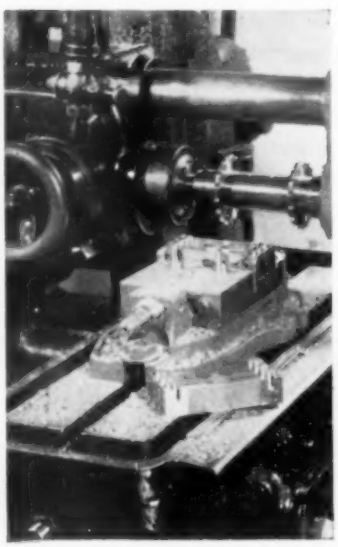
The blocks must be located in a specific position in relation to the cutters. This can be done by stop pins for locating the work transversely or the vertical position could be controlled by steps in the jaws. To have all pieces milled to the same size the blocks must be duplicates in their essential dimensions. These block fixtures are well adapted for holding cylindrical pieces, and they can often be used for second operations on screw machine parts where it is necessary to do additional milling for slotting operations. They are frequently used where it is necessary to mill two slots at right angles. This can be accomplished by placing the work in a square. Where the quantity of parts to be milled is large enough to absorb a heavier initial equipment cost, more elaborate holding devices or fixtures can be used, but their initial cost must be kept down or not allowed to exceed the point at which the unit cost of the proposed product increases. Thus, quantity of parts becomes a chief factor in determining the type of fixture equipment. Fig. 7 is an example of this type of equipment on a standard machine tool.

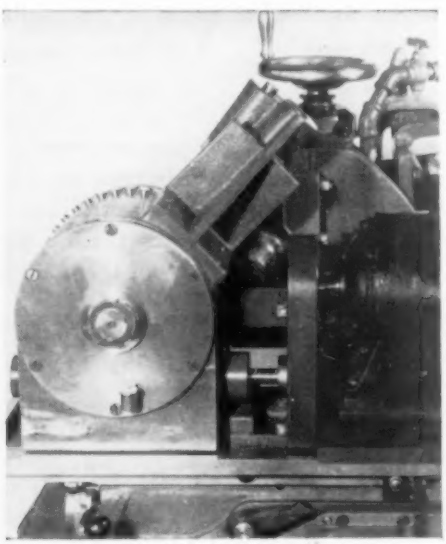
On the drum-type fixture shown in Fig. 8, the part being machined is a bushing having an eccentric hole in one end, and the machining operation consists of putting a slot in the end opposite the eccentric hole. In this instance, all of the operator's time is devoted to loading the pieces. They are clamped and unclamped automatically. This type of fixture is well suited to smaller parts or parts which can be clamped fairly close together so that it is not necessary to feed too great a distance between the actual cuts. In this instance the proper machine and cutter have been selected and maximum cutting efficiency has been obtained. The loading time does not exceed the cutting time, and a maximum production rate is realized.

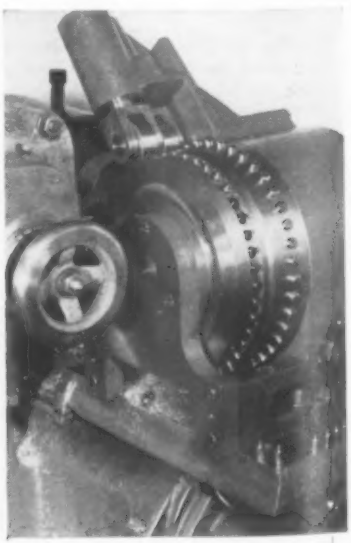
There are many commonly used fixtures, such as bridge-type fixtures, oscillating fixtures, roll-over fixtures and indexing fixtures. The bridge-type fixture is commonly used where it is desirable to have the work change its vertical position in relation to the cutter as the table feeds along. Perhaps a contour has to be milled or clearance is desired as some projection of the work goes by the cutter. A roll-over fixture can be used to obtain a combination of straight-line and rotary motion. Oscillating fixtures are useful in removing wedge-shaped sections. Automatic indexing fixtures offer wide application to work such as drills, taps, equally placed slots, etc.

The application of commonly known fundamentals on all milling work and their consideration during the design, planning, and manufacturing stages will result in a marked increase in efficiency, with a general lowering of milling costs.

Fig. 6 (left) shows a block fixture using two blocks. The work is to be loaded in one while being cut in the other. In Fig. 7 (center) is a drum-type fixture showing fixture drive and relative cutter position. Fig 8 (right), bushings having an eccentric blend hole are placed on pins and seated by means of the roll shown at left and clamped by the roll at the right. Clamping is automatically released and the part ejected by cams on the interior of the fixture.







How to Appraise and Select Salesmen

By Richard S. Schultz, Director

INDUSTRIAL RELATIONS METHODS, INC.

SALES MANAGEMENT today is faced with a situation similar to that which prevailed during World War II and the period immediately following when there was a definite seller's market. No sustained sales effort was necessary and competition was very limited. How soon the picture will change is impossible to say, but when it does, an energetic and efficient sales force will be imperative. If an organization is to have a sales force ready to do a good selling job, certain things have to be done at the right time. While the points made in this article are aimed at the selection of machine tool salesmen, the fundamentals apply to all types of distributors and sales organizations.

In order to maintain a successful sales force, adequate attention must be paid to the three major parts of the job of sales management: selection, training, supervision. Special emphasis on the first of these responsibilities, selection of salesmen, will raise the level of salesmanship considerably.

Sizing up people and making judgments or decisions concerning them is routine, but appraisal and selection of salesmen seems to require special knowledge and skill. This is the consensus of thinking and experience for many years among business executives. Consequently, the practical guide of progressive organizations in the selection of salesmen is: If there is a better way, find it and use it. *Be Careful* is the most consistent advice which is received in regard to the selection of machine tool salesmen. But this precaution means little when the immediate practical circumstances demand that a decision be made on which one man to employ.

The law of averages seems to be a good idea when judging people for employment. This means that the more information and reliable facts obtained before making a decision, the more likely that errors in final judgment will be avoided. It costs a great deal to hire and train a new machine tool salesman. If he is not successful, the time and money wasted and possible customer good will affected are substantial.

Employing a machine tool salesman is a personnel purchase. To make a good purchase, the particular specifications should be met just as when buying equipment and materials. A prospective buyer of machine tools obtains much information and data on operation and performance. He may also observe the particular equipment in operation, and may request operation and performance tests to suit his particular requirements, either before approval of purchase or acceptance of installation. Very little is left to chance.

During the past 35 years, research and practical experience have demonstrated that guesswork can be avoided in appraisal and selection of salesmen. Employing a machine tool salesman becomes a matter of making a carefully calculated estimate of his probability of success. The risk or chance of error can be reduced to a minimum. Guesswork has no place in business. It is similarly not good business practice to hire a machine tool salesman on mere hunch or incomplete information. The calibre of the man must be known before he is hired. It is possible to achieve a high degree of success in selecting salesmen. Some organizations have a record of better than 85 percent in accuracy in the selection of salesmen.

Regardless of the distinction made between tangible and intangible selling, consumer or industrial selling, technical or non-technical selling, there are certain fundamentals which are known from research and experience about how to appraise and select salesmen. For example, the life insurance companies have used successfully a systematic appraisal and aptitude test program for many years as a critical hurdle in selecting salesmen. The leadership of many other organizations in their particular industries is closely identified with their efforts to

Chart I—Steps in Selection and Appraisal on a Machine Tool Salesman

Step 1:	Recruiting
Step 2:	Preliminary Interview
Step 3:	Outline Position
Step 4:	Application Form
Step 5:	Selection Interview
Step 6:	Personnel Tests
Step 7:	Check on References and Personal Investigation
Step 8:	Physical Examination
Step 9:	Home Interview
Step 10:	Appointment Interview

select and build sales forces which will assure their top position in sales volume and profits.

Among the more prominent companies which have installed and developed a program of sales and sales service personnel selection are Chevrolet Division of General Motors Corp., Socony-Vacuum Oil Co., National Cash Register Co., and P. Ballantine and Sons. These organizations are mentioned specifically because of their leadership in sales and sales promotion, and the similarity of their problems to those of the machine tool companies and distributors.

They have dealer, distributor and small sales office operations ranging from one to many salesmen. A particular dealer, distributor or sales manager has the same relative problems. He employs a new salesman as a replacement or addition only occasionally. Each salesman selected from his own organization or from outside applicants must be carefully appraised. How much more serious is the one mistake in selecting a salesman for the small sales organization than for the large firm is quite apparent.

Most machine tool distributing organizations rely on the interview and a check on references and experience in deciding on the suitability of a man. Only about one out of seven uses aptitude tests to aid in salesman selection. Very few salesmen now employed have been screened by means of aptitude tests.

The major qualifications looked for by machine tool distributing organizations, listed in order of their importance, are: personality, ability, experience, character, education and work habits, and knowledge and personal background. It would appear that more attention needs to be devoted to determining ambitions and personal habits of applicants before employment.

An analysis of this information, which was secured through a survey, combined with other information and experiences on machine tool salesman appraisal and selection, provides suggestions for a "man specification." In other words, here is a brief summary, a guide, or specification which can be adapted for use in sizing up an applicant for a salesman's position.

Specification for a Machine Tool Salesman

This is a list of characteristics which can be observed or measured.

1. Diversified abilities to deal successfully with problems involving ideas, people, business, sales, and technical or mechanical situations.

2. Personal relations aptitude or effectiveness in maintaining sustained responsiveness of people. This also includes such characteristics as appearance, manner, health, energy, self-seliance, self-control, initiative, and forcefulness.

3. Integrity and character includes all those qualities about an individual which determine his dependability, honesty and trustworthiness.

4. Mature ambition in terms of a sensible self-perspective. Activity is directed toward self-improvement and growth in accordance with own qualifications.

5. Stable background as reflected in family situation, social-recreational activity and financial status.

6. Communications skill as shown by effectiveness in conveying information and ideas in personal contacts and in writing.

7. Sales-service attitude as indicated by helping customers or prospects to buy what they need and by follow-up service or contacts to maintain good will as a basis for future business.

8. Success aptitude as revealed in past and present record of capacity to succeed and make progress in education, training and work.

Experience

But the question may be asked what about experience in the machine tool industry? This factor is not neglected. It is considered under abilities. Experience is only one qualification. Many men who are selected from among highly skilled machinists, tool makers or engineers for machine tool selling have probably devoted most of their years to becoming effective in dealing with technical or mechanical problems. They may now be expert in dealing with problems of machine tools, but what about their other qualifications and particular skills for contact with people and selling?

Regardless of the source of applicants, the emphasis should then be on selecting the man who has the greatest possibility for development with the organization as a salesman. Good machine tool salesmen are not born, they are made. Training and supervision of the man with the right qualifications is the best and surest way of developing a successful machine tool salesman. This takes time, planning and effort, but it pays off handsomely.

In order to illustrate "How to Appraise and Select Machine Tool Salesmen," three charts have been

especially prepared for consideration. They show an orderly method of accumulating facts and information about an applicant. This general plan is a customary procedure in a number of business and industrial organizations. It is based on the fundamental idea, that—*"a man's judgment is no better than his information"*. The final decision in selecting a machine tool salesman will be most accurate when maximum information is available about a man before employing him.

Chart I shows the steps in selection and appraisal of a machine tool salesman. These 10 steps are followed by many organizations in building a successful sales force. In regard to smaller organizations, it may be asked if all this is necessary since only infrequently is a new salesman employed and the requirements are unique. But reflect for a moment. Look at the 10 steps. For practical purposes, isn't this the procedure which will be followed? Somehow one or more steps may be neglected. If this plan is followed conscientiously, it will actually save time and the chances of being right are likely to be high when employing a new machine tool salesman.

There are many other points to be made in regard to Chart I. For example, Step 1: Recruiting deserves your special consideration. A good job cannot be done if there are not enough applicants from which to choose. Step 9: Home interview, this is very important. Many men fail as salesmen, because of conditions at home.

Chart II which shows seven essential questions in selection of a machine tool salesman may be considered as a guide or framework for the thinking as applicants are sized up according to the procedure just outlined in Chart I. Each of these seven questions should be answered satisfactorily.

Chart III, an interview appraisal sheet for selection of machine tool salesmen illustrates a specific procedure which should be useful in sizing up applicants. The interview is a good practical test for appraisal and selection of salesmen. During an interview there is an opportunity to observe each applicant on how he looks, talks, acts, feels and thinks. Useful information can also be obtained on what he knows and can do.

Interviewing applicants for employment requires a special technique and skill. The emphasis on the part of the inverviewer is to listen rather than to talk or persuade. Some executives and sales managers find it difficult to conduct the selection interview because of its restraint and demand on being passive, observant and analytical rather than active and persuasive.

Chart III is easy to use and will simplify the interview technique if used properly. Note the first part A: application rating. This merely means that each candidate should fill out a suitable application

Chart II—Seven Essential Questions in Selection of a Machine Tool Salesman

1. Has he been successful in varied *contacts with people?*
2. Has he demonstrated *success in previous work?*
3. Does he have special *knowledge* or *information?*
4. What can he *do now?*
5. What does he *like* and *want* to do?
6. What is he doing to be successful and *grow?*
7. What are his *potentialities?*

form. After reviewing this information and indicating impressions, the employer is then ready to properly interview the applicant.

Interview questions illustrate types of questions which can be used to stimulate an applicant to talk while the interviewer listens, observes, analyzes, weighs and decides. There will surely be other questions which will be asked. The sample questions have been purposely phrased so that it is not easy to answer them by yes or no.

At the bottom of Chart III, part C, general suitability rating, is merely a way of summarizing the final decision after carefully considering all information obtained in the interview and from other sources. It should be emphasized that Chart III is merely an illustration. It may be advisable to modify it considerably for general use by distributors or machine tool builders in the selection of machine tool salesmen. It is included here as an example of the best procedures now used in many industries and organizations.

Personnel Tests

One major step in appraisal and selection of machine tool salesmen is personnel tests. More than 35 years' experience and research indicate the value of tests for selection of salesmen. A recent survey among 127 companies shows that 90 percent are finding tests helpful in assuring more accurate selection of salesmen. Some organizations or industries have had standard tests adapted to their requirements. Others have had special testing programs designed to suit the unique demands in selection of salesmen. Custom-made test programs are possible in large sales organizations or under conditions of a cooperative effort undertaken by a particular industry or association. The purpose of personnel tests is to provide an objective or factual rating and information. When this data is combined with other information about an applicant, a more accurate decision can be made on his suitability for employment.

There are certain qualifications about a salesman that can be more reliably measured by tests than by any other appraisal procedure. A test rating is a

Chart III—Interview Appraisal Sheet for Selection of Machine Tool Salesmen. This sheet will help to conduct an interview with the applicant, summarize observations and decide on his suitability.

A: APPLICATION RATING

After reading the application, note under each of the seven main points listed below any comments to help you in the interview.

Then to indicate your impression and as a guide for conducting the interview, mark before each main point: G—Good; S—Satisfactory; D—Doubtful; ?—More Information.

___1. Health
___2. Home and Family Background
___3. Financial Condition
___4. Social-Recreational Activity
___5. Experience and Work Habits
___6. Education and Training
___7. General Value as an Employee

C: GENERAL SUITABILITY RATING

All information obtained should be considered in reaching a decision on applicant's possibility as a Machine Tool Salesman. Your judgment should cover such factors as: Character, Personality, Ability, Interests, Work Habits, Ambitions, etc. Check below ONE statement:

___Will develop satisfactorily
___A hard worker for average record
___Good all-around man
___Doubtful

B: INTERVIEW QUESTIONS

The following questions are examples of how to stimulate the applicant to talk about himself. These or other questions should be used informally to suit a particular individual.

1. What did you do in a typical day in your last position? (Duties, Supervisor, Associates, Business Contacts, Customers.)
2. How do you think your previous experience would be of value in this position?
3. What are your plans or ambitions for the next few years?
4. How do you think conditions may affect the Machine Tool Salesman's job after this defense production period?
5. What are you doing with your spare time?
6. Why do you really want a position with us now?
7. Which part of the Machine Tool Salesman's job do you think you will like best?
8. Is there any special training or information which you believe would be most helpful to you in assuring your success as a Machine Tool Salesman?

calibrated objective measure which compares an individual with other persons. Such a rating is a yardstick or measure which does not depend on personal opinion. However, merely having the test ratings for an individual is not enough. An analysis and interpretation has to be made of the results. Assets and liabilities about an applicant are revealed in terms of red stop signals or precautions and green lights or good qualities.

The balance of ability, personality and motivation should be considered to obtain practical meaning of the test results for an individual. For example, a man who has a good personality but lacks ability or motivation is likely to be unsatisfactory. Such information when prepared professionally in a report form with recommendations indicates the applicant's value to the organization. It also establishes how quickly he may be trained and what assistance or supervision is required to assure his best performance as a machine tool salesman.

After examining this detailed outline of a procedure for selecting a salesman, the question may still be asked "Is all this necessary?" Think for a moment about what must be done before a machine tool is purchased. For example in the book, *Machine Tool Selling* by H. J. Loberg, 48 items are listed under 17 headings as "Information Needed for Quoting." A machine tool costs thousands of dollars and is a substantial investment. Employing a machine tool salesman also represents a considerable investment. It may mean a real loss or gain in profit to the organization and affect future growth of the business. The preceding comments on Charts I to III lead to one obvious conclusion.

Appraisal and selection of machine tool salesmen is a practical matter of following an orderly business or sales management procedure. It also requires an objective viewpoint. Objective facts must be combined with personal opinions and intuitions. But, regardless of how well a machine tool salesman is selected, his success will be determined by the training and supervision he receives.

The following points summarize suggestions which should be helpful as progressive steps are taken to strengthen the sales force.

1. Recruit men a long time in advance of the time they will be needed.

2. Use a suitable application form to obtain information about each applicant.

3. Follow an orderly appraisal and selection procedure as illustrated in Charts I, II and III.

4. If possible, have your present salesmen tested. Such a step may reveal helpful suggestions on developing the salesmen in the organization. It will also serve as a guide to the type of new salesmen most likely to succeed.

5. Applicants should be tested before employment so as to provide objective facts to be used in reaching a decision and to avoid surprises or disappointments after employment.

Taper Pins for Punch Holding

By Federico Strasser

Holding small and medium size punches presents no special problem. They are put into punch-holder plates, their heads are properly peened (Fig. 1a) in order to prevent them from coming out of the punch holder plate during stripping.

For larger tools, the punch is turned from greater stock, leaving a ring for the head as shown in Fig. 1b. This and similar designs are possible only if there is a backing plate or some other means above the punch to take care of the cutting pressure or cutting stress to insure that the punch will cut the stock.

When the punch is put into a punch holder plate as shown in Fig. 1c, the punch must be made with a smaller shank in order to provide a shoulder to take care of the cutting stress. In this case, the holding of the punch presents a serious problem: if the fit between the punch shank and punch shoulder is too loose, the punch is apt to come out of the plate when the stripping pressure is high; if the fit is too tight, taking the punch out for regrinding is troublesome.

The use of taper pins is a satisfactory solution here. The punch shank is made with the correct fit, neither too loose so as to waggle, nor too tight for easy removal when necessary. A taper pin put through the punch holder and punch shank will hold the punch firmly. For greater insurance against loosening of the pin in service, a set screw may be used at the side of the greater diameter.

Calculation of an example demonstrates the ample margin of safety offered by the taper pin. See Fig. 2 for dimensions.

The pin must withstand the stripping pressure; this is calculated by taking 10 percent of the cutting pressure.

$$P_1 = \frac{10}{100} \times K_1 \times \pi \times d_1 \times t \text{ where} \ldots\ldots (1)$$

P_1 — stripping pressure, in lbs
K_1 — shearing strength of the stock, in lbs/sq. in.
d_1 — diameter of punch, in inches
t — stock thickness, in inches

On the other hand the maximal shearing load which the pin may safely support, is

$$P_2 = 2 K_2 \times \pi \times d_2 \times S \text{ where} \ldots\ldots\ldots (2)$$

P_2 — maximal shearing load, in lbs
K_2 — shearing strength of the material from which the pin is made, in lbs/sq. in.
d_2 — mean diameter of pin, in inches
S — safety factor (average: 0.20)

For correct working conditions.

$$P_1 < P_2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Substituting the numerical values

$$\frac{10}{100} \times K_1 \times \pi \times 1 \times 0.1 < 2 K_2 \times \pi \times 0.2 \times 0.2 \quad (4)$$

$$0.01 \pi K_1 < 0.08 \pi K_2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Even, if $K_1 = K_2$ (which is not true, because the shearing strength of the steel sheet stock is always less than that of drill stock from which the taper pin is made) there is a very large safety margin.

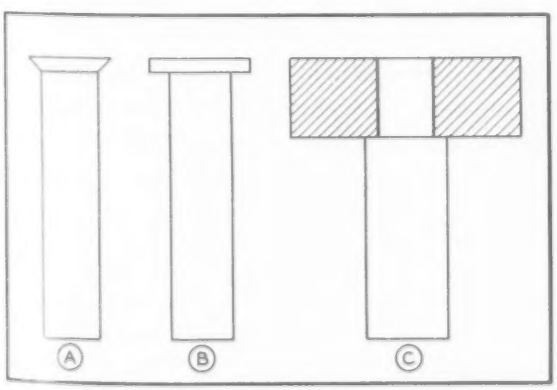


Fig. 1 (left). The punch at the left has a peened head the center punch has been turned from larger stock, and the one at the right is to be inserted in a punch holder plate.

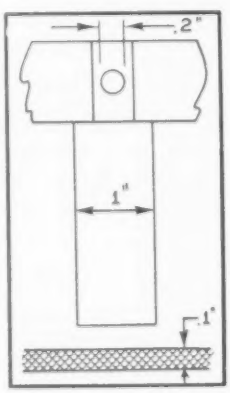


Fig. 2 (right). Use of a taper pin offers an ample margin of safety.

Quality Control of Job Lots

By Dorian Shainin

CHIEF INSPECTOR
HAMILTON STANDARD DIVISION
UNITED AIRCRAFT CORPORATION

Part II

QUALITY WILL have been properly built into the products that were controlled with charts. Also, the great many jobs that did not warrant the use of a control chart because they have been historically giving satisfactory results should be expected to give no trouble. The inspection department can serve a useful function in checking to determine that this situation prevails. Statistical quality control makes it possible for the check to be made economically. A sampling inspection technique turns the trick, a particular type of "continuous" sampling for the job shop.

Sampling inspection falls into an attributes or variables category. The former term describes checking only the acceptability or non-acceptability of the part, such as with go and no-go gages. Sampling by variables consists of recording the actual measurements of the pieces sampled.

Sampling by variables is more economical than that by attributes because, for the same risk levels, a smaller sample size is needed—sometimes as little as one-tenth as much. The Continuous Lot Plot is a sampling plan by variables that has been developed particularly for the economical inspection of successive job lots where the quantity of each lot generally runs under 250 parts. It is a very economical plan when the material is running well within the specification limits, and it clearly and safely announces those lots or those portions of lots that will have to be completely detailed because they are suddenly in danger of exceeding tolerance limits. For material that is either running rather consistently defective or is in the realm of larger lot sizes, the better known Lot Plot is the most effective sampling plan by variables.

The Continuous Lot Plot starts with the filling out of a Lot Plot form for the first 33 pieces made, even though it may take more than one lot to accumulate this total. From the frequency distribution shown on this Lot Plot, as in Fig. 5, the upper and lower lot limits or process limits are calculated by the standard Lot Plot method as described in the article referenced in the footnote.[5] Data from this Lot Plot, entered in the chart in Fig. 7, will determine a sampling plan. Each plan is described by two values, i and f. The first gives the number of successive pieces that must be found within lot limits to sanction sampling, and the f stands for the rate at which pieces have to be inspected and plotted on the Continuous Lot Plot form, Fig. 6. An $f = \frac{1}{3}$ means one piece out of every three received needs to be measured. It is only when a sample piece is found to lie outside the original lot limits that you must return to checking each piece until i number of successive pieces are found all within the lot limits. Then you can start sampling once again at the rate f. For those statistically minded, the chart of Fig. 7 operates the Continuous Lot Plot at an AOQL (Average Outgoing Quality Limit) of 0.3 percent.

General Description of a Short Run Production

A report prepared in 1945 tells of the use of control charts on short run production in one company's gear department.[6] It is interesting to compare some of that company's experiences with current successful practice in many plants.

This experience ranges from spur, helical, and bevel gears with 0.001 in. or less backlash that were made from alloy steels, to those of stainless steel, and phosphor bronze. The small bores of the gears were held to diametral tolerances sometimes as close as 0.0001 in. with out-of-roundness

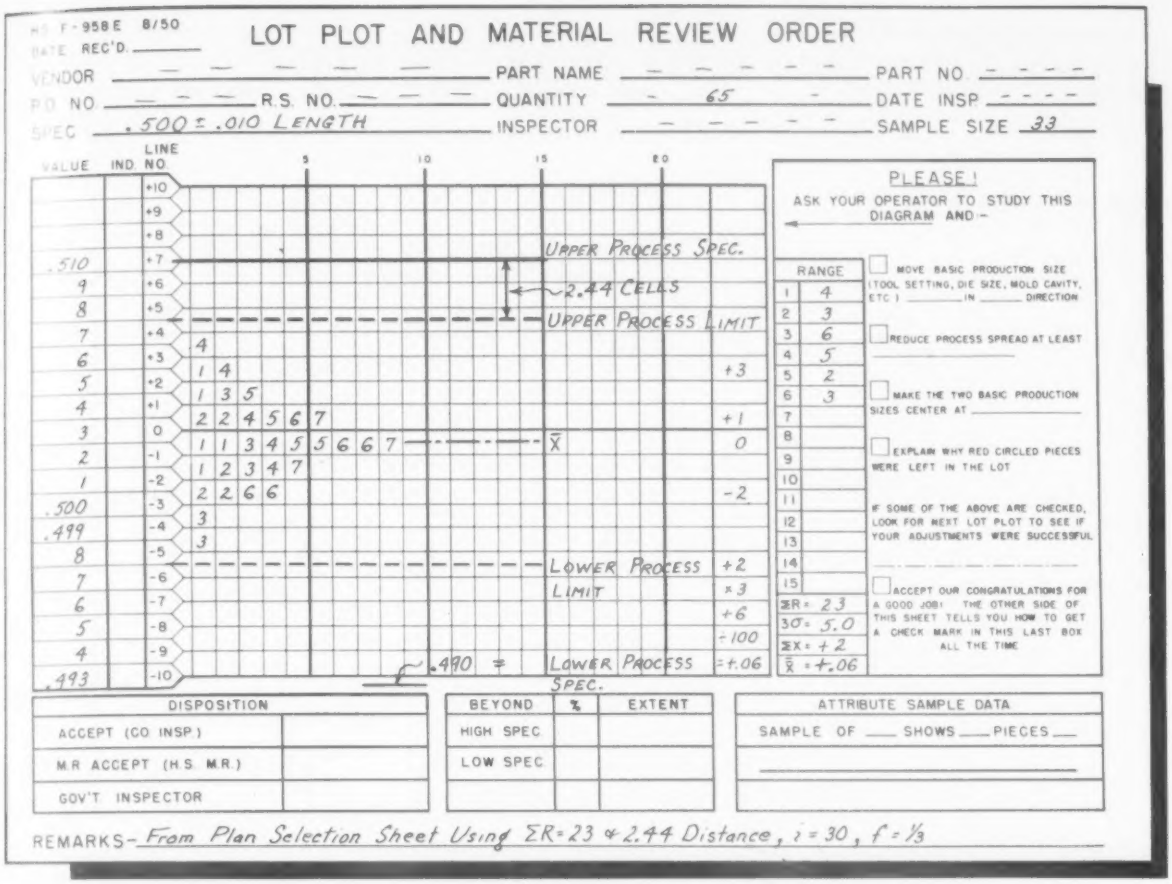

LOT PLOT AND MATERIAL REVIEW ORDER
VENDOR
PART NAME
PART NO.
P.O. NO.
R.S. NO.
QUANTITY 65
DATE INSP.
SPEC .500 ± .010 LENGTH
INSPECTOR
SAMPLE SIZE 33
VALUE IND. LINE NO.
UPPER PROCESS SPEC.
2.44 CELLS
UPPER PROCESS LIMIT
X̄
LOWER PROCESS LIMIT
.490 = LOWER PROCESS SPEC.
PLEASE!
ASK YOUR OPERATOR TO STUDY THIS DIAGRAM AND:-
RANGE
ΣR = 23
30 = 5.0
ΣX = +2
X̄ = +.06
MOVE BASIC PRODUCTION SIZE (TOOL SETTING, DIE SIZE, MOLD CAVITY, ETC.) IN DIRECTION
REDUCE PROCESS SPREAD AT LEAST
MAKE THE TWO BASIC PRODUCTION SIZES CENTER AT
EXPLAIN WHY RED CIRCLED PIECES WERE LEFT IN THE LOT
IF SOME OF THE ABOVE ARE CHECKED, LOOK FOR NEXT LOT PLOT TO SEE IF YOUR ADJUSTMENTS WERE SUCCESSFUL
ACCEPT OUR CONGRATULATIONS FOR A GOOD JOB! THE OTHER SIDE OF THIS SHEET TELLS YOU HOW TO GET A CHECK MARK IN THIS LAST BOX ALL THE TIME
DISPOSITION
ACCEPT (CO. INSP.)
M.R. ACCEPT (H.S. M.R.)
GOV'T. INSPECTOR
BEYOND
%
EXTENT
HIGH SPEC.
LOW SPEC.
ATTRIBUTE SAMPLE DATA
SAMPLE OF ___ SHOWS ___ PIECES ___
REMARKS- From Plan Selection Sheet Using ΣR=23 & 2.44 Distance, i = 30, f = 1/3

Fig. 5. A Lot Plot furnishes the position of process or lot limits needed to pick a Continuous Lot Plot sampling plan. The *1*'s in the squares stand for the first five pieces, the *2*'s for the next five measured, etc.

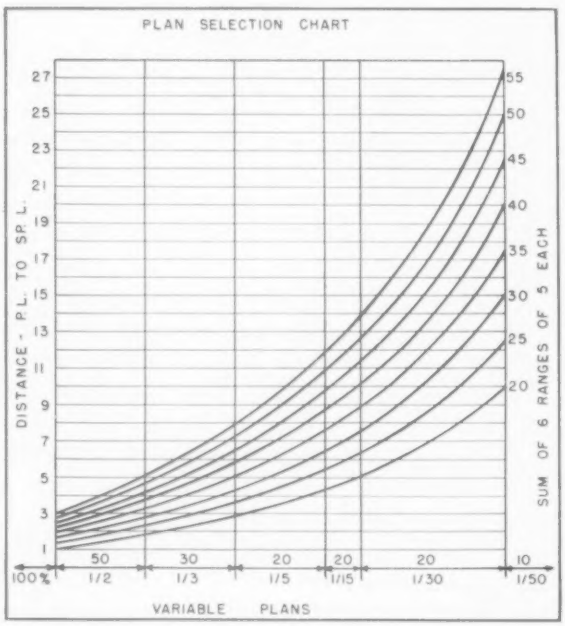
held to the same limits. The sides of the spur gears had to run true to the bore within 0.0005 in. The gear cutting equipment was made by Gleason, Fellows, and Barber-Coleman.

In all of these operations the control charts proved to be a powerful tool in reducing rejections even when the work called for tolerances that seemed impractical. It was found that at least one part in every five produced had to be measured for a control chart to furnish the operator an adequate guide by which to work.

In this plant an order for 200 pieces was unusually large. In some cases a number of orders were grouped for a certain operation, but this was also rare. In general, setups had to be made for each order. By the time enough samples had been charted to compute control limits the order was almost completed. So the data from a satisfactory run were used to establish control limits for future runs. After all, it was reasoned, if a machine could be set to bring the natural tolerances satisfactorily within the drawing tolerances on one occasion, it could be done again. Any unusual results on future runs were then quite successfully blamed on inadequate setups.

Each control chart was a 5 x 8 card to fit in the standard files in the department. A sample size of five pieces each was employed. Individual values

Fig. 6. Data from the Lot Plot entered here result in the selection of one of the plans at the bottom. The *i*'s range from 50 to 10 with the *f*'s that go from 100 per cent inspection to one piece in 50.



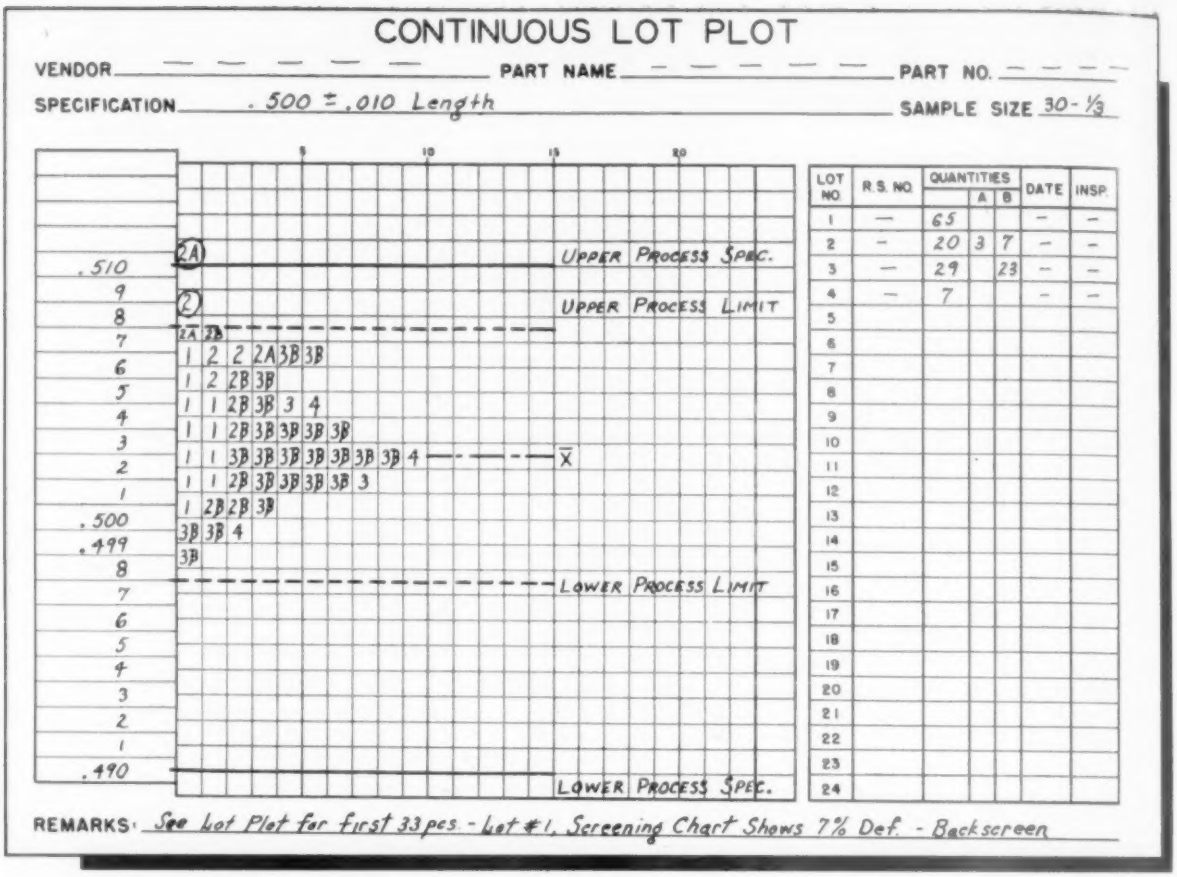


Fig. 7. This plan determines whether there has been a change in the process requiring a different inspection rate. The chart operates the Continuous Lot Plot at an outgoing quality limit of 0.3 percent.

were plotted along one vertical line for each sample rather than figuring any averages, to cut costs. The average was then spotted in on the line by eye with a colored pencil. Range values were written in as numbers taken from a visual inspection of the spread of the five individual points for each sample.

Actual Control Limits Recommended

Another procedure on these cards was reported as being somewhat compromising but it had been employed rather widely in Great Britain. This was setting limits at the start of the order on the basis of placing them exactly in accordance with the recommendation in this article for the use of pre-calculated limits. The report concludes that these departures from high production practice were tried on all general purpose machines in the department because of the small lot sizes there. But it was recommended that whenever possible the more standard procedures explained in the manual of the American Standards Association be followed.

This recommendation directly agrees with the procedure of using the actual control limits for the process, in accordance with the more modern recommendation, after the first 30 pieces have been recorded.

Don't Be Misled

Scientific quality control is useful both in a production shop and a job shop. The main difference is in the type of technique employed. Experience points to the fact that contrary to popular opinion, statistical methods are not economically restricted to operation of automatic machinery and large production runs. In fact, the use of statistical quality control in a job shop may very often be more profitable than in a production shop, and certainly is always enhanced by more variety.

References

1—"Predicting Machine Capability," Dorian Shainin, *Machine Design*, January, 1950.

2—Figs. 1 through 4 and quotation by permission from *Quality Control Handbook*, edited by J. M. Juran. Copyright 1951, McGraw-Hill Book Co., Inc.

3—"Advances in Inspection," Dorian Shainin, *The Tool Engineer*, March, 1950.

4—"Diagnosis with Diagrams," L. A. Seder, *Industrial Quality Control.*

5—"The Hamilton Standard Lot Plot Method of Acceptance Sampling by Variables." Dorian Shainin, *Industrial Quality Control*, July, 1950.

6—O.P.R.D. Quality Control Report No. 4, C. G. Schmid, WPB, 1945.

Nomograph for Determining Maximum Tensile Stress in Snap Rings

By Leonard M. Majeske
REGISTERED ENGINEER

THIS NOMOGRAPH may be used to determine the maximum stress in steel ($E = 30 \times 106$) snap rings when used either externally on shafts, or internally in housings when the snap ring is in expansion or in contraction, respectively.

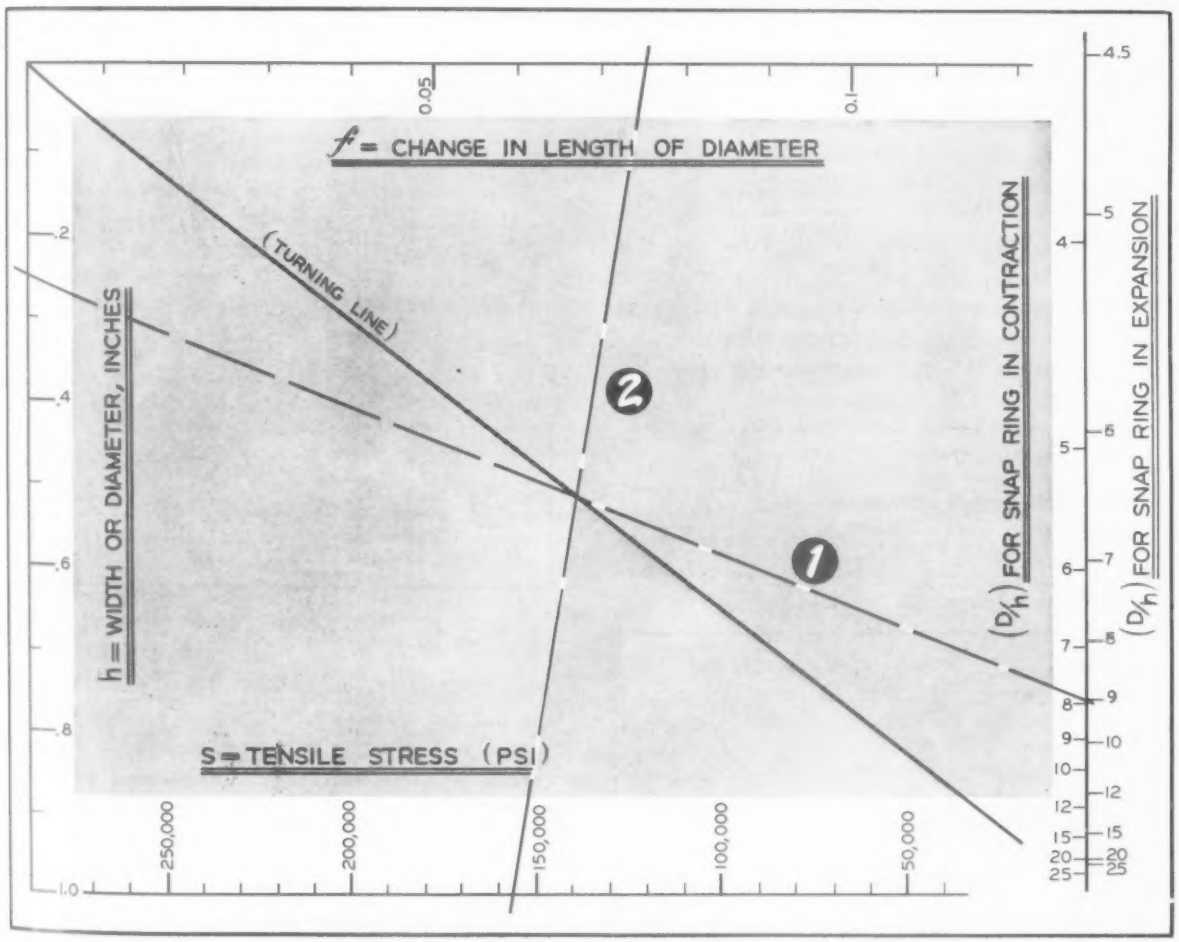
In the example used to illustrate the use of the chart, it is presumed that the snap ring is to be used internally in a housing, which puts it in contraction, and that it has the following dimensions:

D = mean diameter of ring when free = 2.0 inches

h = radial dimension of section = 0.25 inch

f = decrease in diameter across center = 0.075 inch

Compute $\frac{D}{h} = 8.0$. Then draw line (1) from $\frac{D}{h} = 8$ on the contraction scale to $h = 0.25$. Connect the intersection and point $f = 0.075$, extending the line to $S = 156{,}000$ psi, which is the answer.

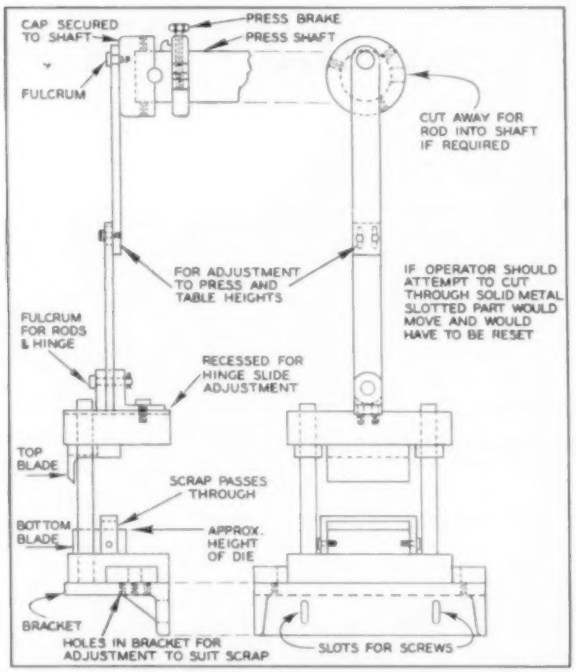


Gadgets

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Scrap Chopper

The disposal of scrap strips of metal in press and stamping shops can be made easy by the installation of a scrap cutter if it is not already a part of the die. The attachment shown here can be made from parts of old dies, is quickly installed or removed from the press.

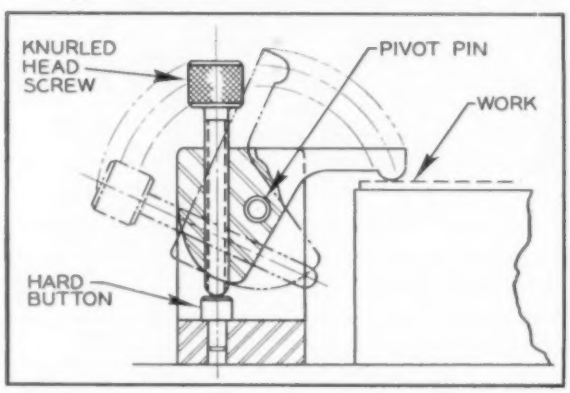

CAP SECURED TO SHAFT
PRESS BRAKE
PRESS SHAFT
FULCRUM
CUT AWAY FOR ROD INTO SHAFT IF REQUIRED
FOR ADJUSTMENT TO PRESS AND TABLE HEIGHTS
IF OPERATOR SHOULD ATTEMPT TO CUT THROUGH SOLID METAL SLOTTED PART WOULD MOVE AND WOULD HAVE TO BE RESET
FULCRUM FOR RODS & HINGE
RECESSED FOR HINGE SLIDE ADJUSTMENT
TOP BLADE
SCRAP PASSES THROUGH
BOTTOM BLADE
APPROX. HEIGHT OF DIE
BRACKET
HOLES IN BRACKET FOR ADJUSTMENT TO SUIT SCRAP
SLOTS FOR SCREWS

The scrap strip passing through the guide is cut at its weakest part and falls into a container. The cutter can be adjusted to suit the bolster plate, while the hinge and the movable die shoe make it possible to cut the scrap at the most convenient place.

C. G. Spicer
Guelph, Ont.

Quick-Acting Clamp

A new kind of quick-acting clamp is shown here. The clamp arm is a loose fit on the pivot pin. A couple of turns of the knurled-head screw will allow the round end of the screw to clear the hard button and the extra weight back of the pivot pin will cause the clamp to swing back out of the way. A flick of the finger brings it back into position and a few turns tightens it.

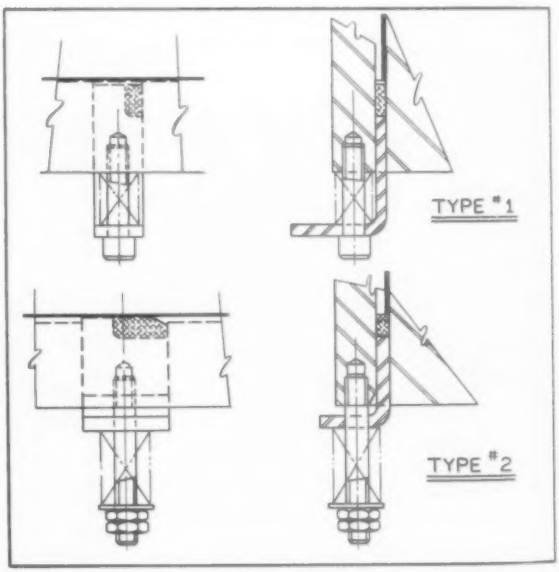


Inmon Hale
Piqua, Ohio

Improved Stops and Pushers

The problem of keeping die station stops (type 1) and pusher fingers (type 2) in operating condition on progressive dies for long run production jobs is often troublesome. This difficulty can be overcome by simply brazing a carbide insert to the pusher or finger, which has been notched as shown in the illustration, at the point of greatest wear.

It will be noted that this application is particularly useful when using thin stock, since the material has a tendency to wear grooves in the pushers. This type of station stop is applicable for heavy stock which causes the breakdown at the corner and may restrict movement of the stop.



The construction of the pusher (type 2) should be noted in particular. Although flat springs are used extensively, it has been found that by using the method illustrated, not only is a range of pressure obtained, but a compression will yield longer service before failure.

John E. Orban, Jr.
Philadelphia, Pa.

The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of $5.00 for each item.

De Soto Divison: A Text on Automation

By Gilbert P. Muir

DE SOTO DIVISION'S Warren Avenue plant, on Detroit's West side, provides adequate proof that if Clarence Bleicher didn't invent the word *automation*, he's gone a long way in making it a practical term. It's a plant with some impressive statistics, and the 'push-button plant' label with which it was tagged by the newspapers has some substantiation.

Planning for the De Soto V-8 engine plant started under President Bleicher's direction early in 1950 when it was decided to use an adaptation of Chrysler's larger V-8 engine in De Soto's 1952 models. Bleicher handed De Soto's tool engineers a virtual carte blanche, with the one dictum that production costs must be kept at a minimum.

Setting up a high-production engine plant in De Soto-Warren's 330,000 sq ft provided a logical lead-in to transfer-type equipment as far as possible, because there just isn't the space to string out long lines of single-purpose machines. The cylinder block line is a good indication of the planning in this direction, with a total of 13 machines on the line performing 702 operations—and 180 of these operations performed on one 18-station transfer machine.

The Man

C. E. Bleicher has been in the automobile industry since the teens of the century, has been with Chrysler divisions since the twenties. Oldtimers in the industry refer to him as one of the few good tooling men left, and he is an active member of the exclusive fraternity of automotive executives whose personal efforts have helped build the industry to its present productive force.

Mr. Bleicher moved from Chrysler's Highland Park plant, where he was staff master mechanic, to De Soto in 1937 as vice president and general manager. He contributed heavily to Chrysler's war production during World War II, and his own De Soto division was a big producer of bomber assemblies and gun mounts for tanks.

Clarence E. Bleicher, De Soto's president and general manager, against a background of his V-8 engines on the test racks.

In 1944 Bleicher was named president of De Soto—the first time in De Soto's history that one man held both titles of president and general manager. His concern with tooling is active and direct; the new V-8 engine plant is his personal baby.

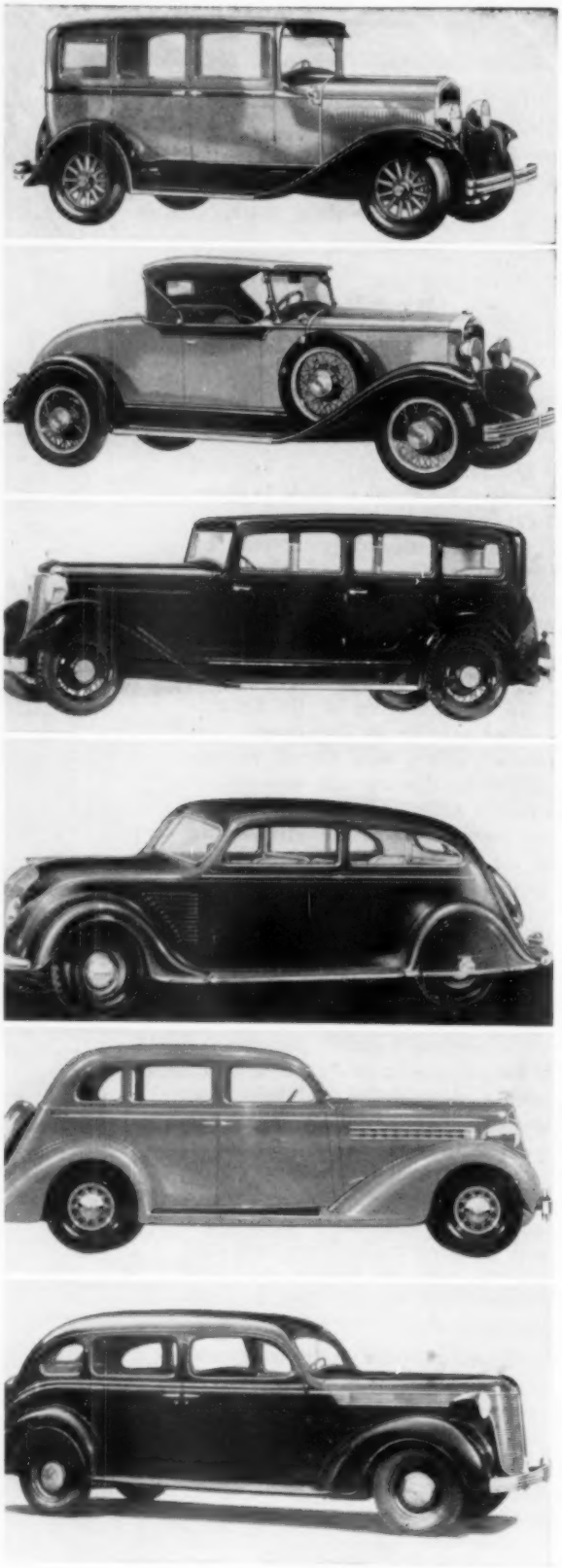
A Case History of Tooling

De Soto's tool engineers initiated planning for the new plant in June, 1950, and had detailed cost and equipment estimates completed by September. There were a lot of firsts involved—not only was this the first complete engine production for De Soto, but in addition most of the men were new at working with each other.

Tool engineering at De Soto is headed topside by the master mechanic's office, with overall responsibility for development and maintenance of tools and equipment. Thus the central core of tool engineering of the engine plant consists, under Bleicher, of John H. Meyn, master mechanic of the De Soto division; William B. Shimer, assistant master mechanic and senior tool engineering executive at the engine plant; and Kurt Skrade, chief tool engineer.

As mentioned earlier, planning for tooling began in mid-1950 with the release of engineering drawings on the V-8 engine. Initial planning operations were somewhat complicated by the fact that in a number of instances final drawings were not yet completed, and early discussions with machine tool builders were on a general basis to protect cost and delivery, with specific details to follow later.

Heart of tool engineering and plant engineering at De Soto is the operations sheet, which represents the final planning stage by tool engineering. Listing all operations sequences, machines, and tools for all parts manufactured, the operations



A capsule history of automobile styling—De Soto's evolution from 1928 to 1952. From top to bottom: the sedan for 1928; a 1930 sports coupe; the big sedan for 1932; the Airflow design for 1934. Styling retreated a little in the 1935 design second from bottom, and the 1937 sedan at bottom further develops this trend.

sheets form the basis for plant layout, procurement of equipment and tools, and engineering of associated processing installations. By way of statistics, there are some 1600 operations sheets connected with the production of the V-8 engine.

Tooling estimates were ready for management consideration by September, 1950, and with approval of a final budget machine procurement began immediately. Here our case history might well touch on a few of the specific details involved in the not-too-common tooling from scratch of an automotive engine plant.

Before tooling estimates of any accuracy can be developed our engine has been manufactured on paper innumerable times. Preliminary estimates and consultation with plant engineers provide some of the early answers; then initial discussions with machine tool builders to establish the practicality of operations and sequences which seem desirable. This stage of planning can have wide effects, as for example when De Soto tool engineers wanted to replace the conventional method of using boring bars to bore the cam and crank main bearing bores with a new approach which involved individual boring heads. Foundry as well as machining problems entered the picture until a solution was evolved in the form of holding closer tolerances on the rough blocks, and separating the boring operations, with the cam bore first, in two stages, followed by the crank bore.

Then came the detailed estimates for management, covering costs on machines, tools and fixtures, and including estimates from plant engineering on availability of plant space for desired operations layouts, cost and layout of required processes (plating, shot peening, etc.), and aided by manufacturers' estimates on tooling. Coordinating a substantial part of this activity is the Central Routing division, operating on a Chrysler Corporation level. Since obviously there are some parts which are either undesirable or uneconomical for manufacture by De Soto, this agency has the responsibility of obtaining accurate cost comparisons within and outside the Corporation for a proper decision.

The planning, designing, purchasing, building and installing of almost 8300 tons of machine tools requires a lot of close work between the purchaser and builder, and De Soto engineers remember when specific days were established for regular meetings with each of the larger vendors to determine final designs on transfer equipment. Machine design, parts handling, operations sequences and clamping provisions, to name a few, had to be ironed out not only between De Soto engineers and the machine tool builders, but in many cases between individual builders so that separate transfer machines could function as a unit.

The Plant

Some 13,000 ft of conveyors indicate the emphasis on materials handling which formed an important part of De Soto's planning for smooth flow of production. This phase of planning for production is one of the responsibilities of plant engineering, which in addition provides processing lines such as plating, shot blasting plant services, layout and maintenance. John Straley heads De Soto's plant engineering with Sheldon Kavieff directing this phase at the Warren engine plant.

The need for fast, effective materials handling recognized, planning was pushed right along with development of machine tool designs—"80 percent of materials handling is done in the original layout; you can't do a monumental job of materials handling unless you start out right to begin with." Equally important is the fact that, unlike a more flexible manufacturing operation, the engine plant is so tight and highly integrated that a change in machine layout or materials han-

illing at this stage has drastic effects over a considerable part of the plant. Plant layout developed to the final detail stage by the time machines were being delivered, and the integration of some of these transfer machines had ingenious results. On one segment of the block line, for example, over 200 ft of transfer machines are interlocked into one unit, in spite of the fact that the floor slopes, in that direction, as much as 16 in. in 500 ft. De Soto got around that by building separate foundations for each of the machines, so that each was, in effect, on a separate, level step, and then connecting the machines with air-operated elevators.

In operation, the block rolls on to the elevator, trips a switch which raises the elevator to the height of the next machine, then rolls off to the next operation. As it rolls off the elevator it trips another switch which lowers the elevator to the original position.

A variation on this theme occurred on the head line, where several operations had to be on the same plane. After raising one end of the line eight inches (tapering to zero), the No. 1 Footeburt, Cincinnati mill, and Nos. 2 and 3 Footeburts could be interlocked and run with one operator.

Materials Handling—Conveyors

Extensive investigation and study of other plants convinced De Soto engineers of the advantages of the hand-push overhead conveyor, and the materials handling system was designed with this equipment as the basic means. Besides ease of movement, the hand-push conveyors offered the advantages of an uncluttered floor which De Soto wanted.

De Soto theory is to run the conveyor practically through the man. The centerline of the conveyor is kept about two feet from machine obstructions, and carriers can be turned 90 deg from the axis of the conveyor. Main line of the conveyor is north-south, with machines running E-W, and the system is designed so that the operator is placed on a by-pass to the main line. A switch is put on the main line, and the conveyor runs E-W on the by-pass (parallel to the work). If there are operations ahead of or behind him, racks can't be shoved into his area unless he trips the switch.

Smoothness of operation and ease of parts handling are advantages cited for this type of conveyor layout; often an operator working with a conveyor must swing almost 180 deg to get the part, turn back to the machine, then back again to load the part on the carrier. By bringing the conveyor close to the work this motion is reduced considerably.

For example, on the piston line, racks are spaced about three feet apart on the conveyor, with a rack carrying rough work following an empty carrier. The operator works between the racks, taking a piston from rough stock with his left hand and loading it into the machine. He unloads the part with his right hand and places it on the finished-work rack—with all motion restricted to movement of the hands rather than of the body.

Banks of parts located between work stations are a necessity, of course, in high-volume production such as this, and the hand-push overhead conveyors provide an added advantage in maintaining a 'floating' bank with considerably less cost than would be the case with floor storage. Besides avoiding the time consumed in stacking for floor storage, valuable floor space is saved.

Empty carriers, at the end of the line, are returned to the starting point by side pushers, eliminating the need to push carriers back by hand.

In the early days of planning De Soto plant engineers were reminded

The next decade or so brought on about as great a departure as did the first. From top to bottom: a two-door sedan for 1939; a stronger accentuation of today's styling in a 1941 coach; then the integral fenders in the model introduced in 1946. 1949 and 1951 models are next, with the 1952 De Soto at bottom.

of the difficulty of keeping lines of cam grinders operating because of coolant difficulties—grinders designed with individual sumps and pumps loaded up with slurry to the point where it was necessary to clean out the sumps as often as twice in a single shift.

The Centralized Coolant System

An engineer was assigned full-time to research on the problem, and sentiment soon began to drift in favor of grouping machines—or in other words a centralized system of collecting, filtering, reclaiming and distributing coolant to a number of machines simultaneously. Plymouth division had had some experience with centralized trenches for collecting spent coolants, and this and other methods were analyzed.

Analysis of coolant requirements indicated that two systems, cutting and grinding would handle most machining operations: Both cast iron and steel are combined in the grinding coolant system, and De Soto engineers feel that the fine filtering of coolant is responsible for absence of difficulty.

For steel turning operations, a Cuno mechanical filter was developed which filters chips to about 0.0025-0.003 in. The filter consists essentially of a cage on which is chased a fine thread. Wire is wound around the thread, and the pitch distance determines the spacing, or size of particles passed or rejected.

Grinding presented more of a problem because of the fine nature of particles involved and the difficulty of getting them out of suspension in the coolant. A check was run on the carrying velocity necessary to keep particles in suspension while in transit through the collection trench, and a minimum flow rate of four to five feet per second was established. To be on the safe side the actual operating flow was set at eight feet per second.

If used grinding fluid is allowed to set long enough, particles will settle out without filtering, but the 25-30 minutes required for this, with a coolant pumping rate of 1000 gpm, would require at least a 25,000 gal tank. A preliminary settling period of 8½ minutes was established to remove the large particles, and a filtering operation was planned for the fines.

Fines are screened out by a Delpark paper filter system, which consists of a continuous paper roll pulled over a frame resembling a metal doormat. Special manifolding was developed to prevent a solid stream of coolant from hitting the middle of the filter and overflowing.

In addition to the 1000-gpm grinding fluid system, capacity in the turning system is 2500 gpm, and 150 gpm each for the aluminum turning line and for honing and boring operations—the two latter lines are handled separately.

Completed De Soto engines are conveyed to this battery of 36 test stands, where they are put through a 20-minute test cycle under varying loads.

Chip Collection

Heart of the cast-iron chip system are the main drag conveyors running north-south in the V-8 engine plant. One conveyor is provided for dry handling of cast iron chips, another for carrying steel turnings with accompanying coolant. Chips from cast iron machining operations fall from the machines into the conveyor trench and are carried to the south end of the plant, where they are discharged to another conveyor running east. Chips are carried on this bucket conveyor to above the second floor level and held in hoppers, from which they can be discharged into railroad cars moved into position directly below. The hoppers have a capacity equal to about one-and-one-half cars, and the arrangement reduces both manual handling and railroad demurrage charges to a minimum.

Chips from the steel section are carried, with coolant, through an underground sluice-way running parallel to the machine lines. These lines empty into a central pit. Turnings are carried out of this pit by means of a central conveyor.

The chip collection pit is kept clean by a bucket arrangement on the conveyor which drags the bottom of the pit, and picks up on the return trip chips which have fallen through the heavy-particle conveyor. Protection to coolant pumps is afforded by a pump suction pit; incoming used coolant flows into the pit through an arrangement of zig-zag filters before it enters the pump, and possible damage from refuse thrown into the conveyor trenches is headed off.

Centralized Dust Removal

The De Soto engine plant exhausts some 160,000 cu ft of air per minute through a centralized dry collecting

system which removes dust from each machine, filters it, and can return it to the building in winter for conservation of heat. Eight platforms—each handling 20,000 cfm—are concentrated in the cast iron department.

A low-velocity intake is aided by closing up the machines as much as possible and by using large hoods over the machines instead of small slots—De Soto wanted only the dust which rolls off the machine, not chips which could raise hob with the dust collector. Velocity of incoming air is held to 300 fpm; in the ductwork it is about 4500 fpm.

Dust is carried first to a Cycoil type collector where air and dust are spun to remove the heavier particles, which are dropped to the chip conveyor. The light particles remaining move on to viscous impingement oil filters for screening. During the summer the system exhausts outside to provide a frequent air change; in winter the air is filtered and recirculated to the plant. De Soto men make a point of the fact that the ceiling is light at the location where the filtered air is returned for recirculation, and so far there is no evidence of discoloration.

The Machines

The 322 machines in De Soto's V-8 engine plant perform 3,298 operations on 141 parts. Twenty-two of these are transfer machines, the largest of which in number of operations is the No. 4 machine on the cylinder block line, which performs 180 operations in 18 stations. The complexity of modern automatic machine tools is indicated by the 175 electrical controls and ten miles of wiring built into this machine. Of some 5500 cutting tools required, about 3300 are tungsten carbide.

A complete sequence of operations is presented later in this article for the five parts which, in their machining, represent the highest level of automation: cylinder block, cylinder head, intake manifold, chain case cover and crankshaft. Some details of especial interest are presented here.

A complete change in operation was accomplished in the machining of the valve tappet holes in the cylinder block, where the problem has been to maintain a tolerance of 0.005 in. on the diameter and at the same time keep the hole square with the camshaft bore. The small amount of space in the valve tappet pocket is inadequate for bushing plates and, because of the location of the tappet holes, drill plates have had to be hinged. De Soto's revised operation machines the holes with precision boring heads, eliminating the bushing plates altogether. Not only is the means more satisfactory, but in addition foundry problems have been simplified.

Machining of De Soto's hemispherical combustion chamber has been changed from a complicated contour generating operation to a precision, high-speed job. The operation is handled on a four-spindle generating mill which simultaneously machines two combustion chambers in two heads—in one cycle. Tolerances held are 0.004 in. on the depth and 0.004 on the radius.

On the intake manifold De Soto states that more operations have been combined than have ever been accomplished previously on this part. With the exception of a broaching operation, all drilling, milling, spot facing and tapping are performed on a Snyder 22-station transfer machine.

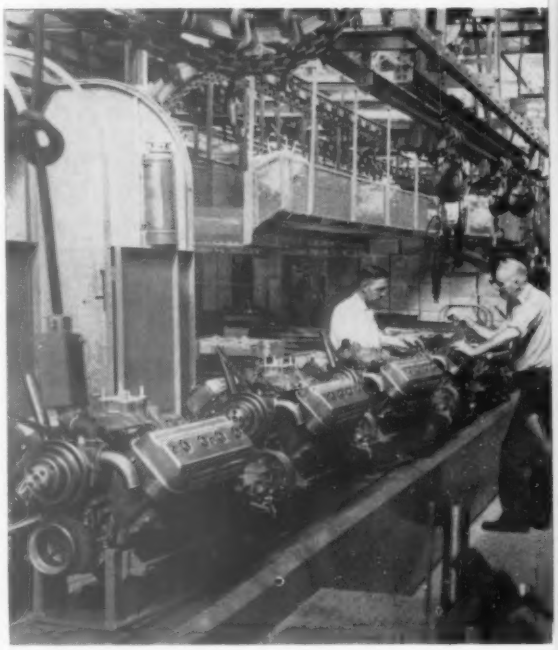
Ninety-six operations are performed on the chain case cover on a Greenlee 34-station in-line transfer machine. Moving fixtures or pallets formerly associated with transfer machining of parts such as this have been eliminated; the part slides on rails in a system similar to that on the block line.

Entering the machine on its side, the part passes through 13 stations, is rotated 90 deg horizontally by an automatic turnover station, and proceeds for 13 more stations. The chain case cover is rotated 90 deg vertically so that the ends of the casting can be machined, progresses through seven more stations, is ejected at the 34th station.

Crankshaft balancing on the new engine is handled in a unique two-stage operation. In the first stage the operator loads the shaft into the rough balancer, where an electronic unit automatically checks the amount of unbalance and presets the drill units in the correction machine. The shaft moves into the drill correction unit, is rough and finish drilled for balance, then is automatically removed to the finish balancing machine. A second operator here throws a switch to electrically indicate the amount of unbalance to a finish drill correction unit, where the crankshaft is drilled and transferred to the next operation, a thrust bearing polishing machine. Design of the transfer mechanism is such that there always is a crank available for the next operation regardless of quantity or location of cranks on the conveyor.

Close tolerances with automatic operation are combined in a couple of interesting machining jobs. The finish bore in the bronze bushing at the piston pin end of the connecting rod is held to 0.0003 in. ID in a

Final assembly line in De Soto's new V-8 engine plant. Engines are mounted on movable steel plates which permit the men on the line to swing the engines into proper working position.



machine which bores three connecting rods simultaneously, boring both piston pin and crankshaft bearing holes in a single operation.

On the piston, another machine combines finish boring of the piston pin hole to a 0.0003 in. ID tolerance with an elliptical turning of the piston OD, and the machining of the lock ring groove in the pin hole. Biggest feature of the machine is the machining of the elliptical outside diameter by means of a turning operation. A tolerance of 0.002 in. is maintained between the major and the minor axis of the elliptical skirt. The machine, built by Ex-cell-o Corp., simultaneously machines 9 pistons at a time, with three pistons completed at each cycle.

Shot peening also has come in for some added applications at the De Soto plant. Cleaning the air passages of the intake manifold of particles which later might work loose has historically been a troublesome operation, and De Soto found that peening these devious passages has been very effective. The process is also applied to removing toolmarks from undercuts on crank bearings, and to removing burrs from the crankshaft cheeks.

Rocker shaft cleaning has been eased by using shot peening to remove burrs created by drilling of the many oil-supply holes through the wall of the shaft. Because of the small ID and the length of the shaft, cleaning with a file or wire brush is difficult; the automatic peening machine alternately forces shot through each end. In addition to burr removal, the peening is also effective in removing scale on the inside of the shaft which is created during hardening.

THE OPERATIONS

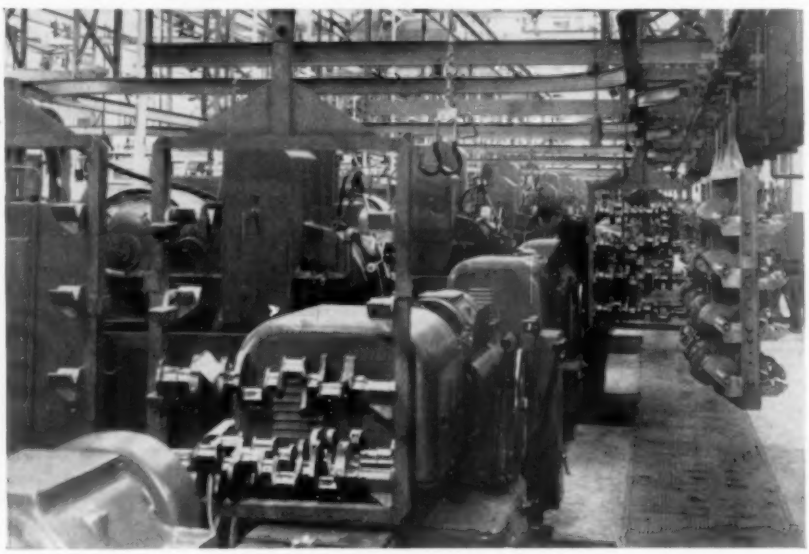
A complete sequence of operations is presented here for five parts which represent the most advanced tooling in De Soto's V-8 engine plant.

Machining operations are explained for each station at each machine, and corresponding station numbers are indicated at the proper location on the plant layout print beginning on page 61. By following the text description with the print, a complete plant tour on paper can be had with a detailed description of the overall operation, work performed at each station, type of equipment used, and the specific part of the machine in operation at the individual station.

Cylinder Block

Operation #10—Receive, inspect and load pallets on roller conveyor to transport to shot blast.

The De Soto plant uses a power- and free-conveyor system. Stock from the main conveyor line can be moved easily by hand to the machine. After completion of work, part is attached to the power conveyor system for movement to the next machine.



Operation #20—Shot blast and shake. *Pangborn Roto Blast.*

Operation #30—Stock.

Operation #50—Mill locating pads, pan rail and bearing cap slot. Drill and ream locating holes. Rough bore cam and crank holes. *Ingersoll 11-station transfer mill.*

Station 1—Load-depress cycle button.

2—Mill four locating spots on banks. *Two-spindle, 2 traveling heads.*

3—Turn block 180 deg—pan rail up.

4—Rough bore crank bearings (with caps off) and front intermediate cam bearings. *Five-spindle double horizontal slide, cam and crank boring unit with a 2-spindle head for front bearings.*

—(1) *2-spindle head for rear bearings*

—(1) *single spindle angular head for center crank bearings.*

5—Rough mill pan rail. Four-station, 8-spindle milling unit (stations 5, 6, 7, 8).

6—Rough mill bearing slot (1/16-in. stock each pass).

7—Finish mill pan rail.

8—Finish mill bottom of cap seat; finish shave sides of bearing slot.

9—Drill, ream and chamfer two 0.749—0.7505-in. dowel holes — drill ten 27/64-in. holes 1-9/16-in. deep. *Two*-position, 14-spindle vertical drill, ream and chamfer unit.

10—Inspect pan rail bearing slot and dowel holes.

11—Unload

Operation #60—Mill slides of main bearings and bearing notches. Drill and chamfer pan rail holes. *Ingersoll 11-station transfer machine.*

Station 1—Load part

2—Mill front end of crank

bearings. *Four-spindle vertical mill unit.*

3—Mill rear end of crank bearings. *Five-spindle vertical mill unit.*

4—Mill bearing lock grooves. *Three-spindle vertical mill unit.*

5—Drill: eighteen ¼-in. holes 1 in. deep four ¼-in. holes one ½-in. hole 3 in. deep (1st pass) one ¼-in. hole (endmill) (⅛ in. deep). *Twenty-four-spindle vertical drilling unit.*

6—Drill: four 15/64-in. holes through one 31/64-in hole 6 in. deep, final pass one 7/32-in. hole 13/32 in. deep (in pan rail). *Ten-spindle vertical drill unit*

7—360-deg turnover unit for chip removal

8—Inspect holes in pan rail and four cap seats

9—Chamfer and counterbore eighteen ⅜-in. x 90-deg holes, ten 9/16-in. x 90-deg holes (in pan rail). *Seventy-eight spindle vertical chamfer unit*

10—Ream one 0.2457-in. hole 13/32 in. deep. Chamfer one ⅜-in. hole in pan rail. *Six-spindle vertical ream unit*

11—Unload

Operation #70—Mill cylinder banks, top and bottom filter pad; rough bore cylinder bores and chamfer cylinder bores. *Ingersoll 10-station transfer machine.*

Station 1—Load and turn block pan rail down.

2—Rough top of cylinder block. *Three-spindle milling unit for stations 2 and 3*

3—Finish mill top of cylinder block

4—Rough mill cylinder banks. *Four-spindle milling unit for stations 4 and 5*

5—Finish mill cylinder banks

6—Inspect bank surfaces

7—Rough bore cylinder holes. *Two-head 8-spindle cylinder boring unit.*

8—Chamfer top and bottom of cylinder bores. *Two-head 8-spindle cylinder chamfering unit.*

9—Mill one cut on oil filter pad on side of block. *Single spindle rotary head milling unit.*

10—Unload

Operation #80—Drill and chamfer cylinder bank holes as follows: Greenlee *18-station automatic transfer drilling machine.*

Station 1—Load

2—Drill ten 27/64-in. holes for ½-13 tap. *Equipment-45 deg L. H. upper angle unit #1.* Drill eight 3/16-in holes ½ depth in tappet holes in right hand bank. *Machine is 80 deg 45 min R. H. upper angle head #2 8 drill spindles*

3—Drill eight 3/16-in. holes tapped depth in tappet holes in L. H. bank. *Equipment-80 deg 45 min L. H. upper angle unit #3.*
Drill ten 27/64-in. holes for ½-13 tapped holes in R. H. bank. *Equipment-45 deg R. H. upper angle unit #4.*

4—Drill eight ⅛-in. holes through in tapped holes in L. H. bank. *Equipment-80 deg 45 min L. H. upper angle unit #5.*
Drill three ¼-in. holes marked *W*; two 3/16-in. holes marked *B*; five ⅜-in. holes marked *X*; three 5/16-in. holes, two 11/32-in. holes marked *Y*; R. H. bank. *Equipment-45 deg R. H. upper angle unit #6.*

5—Drill two ¼-in. holes marked *W*; three 3/16-in. holes marked *B*; five ⅜-in. holes marked *X*; three 5/16-in. holes; two 11/32-in. holes marked *Y*; L. H. bank. *Equipment-45 deg L. H. upper angle unit #7*
Drill eight ⅛-in. holes through, R. H. bank. *Equipment-80 deg 45 min R. H. upper angle unit #8*

6—Idle

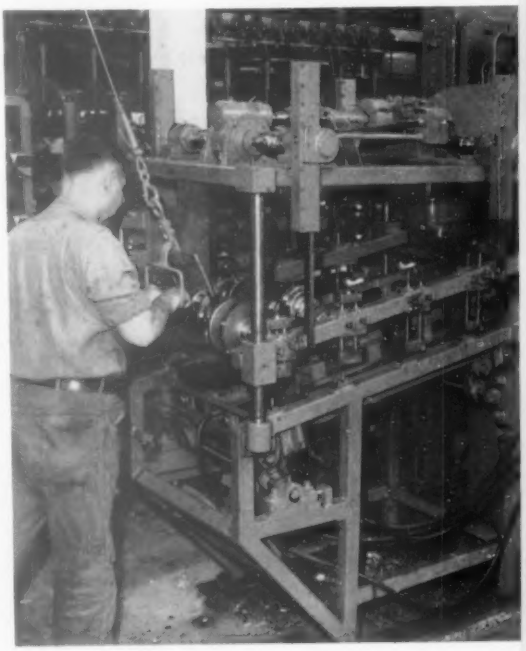
7—Drill eight 61/64-in. holes through and spot drill tappet boss, L. H. bank. *Equipment-26 deg L. H. upper angle unit #9*
Drill eight 61/64-in. holes through and spot drill tappet boss, R. H. bank. *Equipment-26 deg R. H. upper angle unit #10.*

8—Drill four 53/64-in. holes for tappets, L. H. bank. *Equipment-26 deg L. H. upper angle unit #11.*
Drill four 53/64-in. holes for tappets, R. H. bank. *Equipment-26 deg R. H. upper angle unit #12.*

9—Drill remaining four 53/64-in. tappet holes, L. H. bank. *Equipment-26 deg L. H. upper angle unit #13.*
Drill remaining four 53/64-in. holes in tappets, R. H. bank. *Equipment-26 deg R. H. upper angle unit #14.*

10—Drill two ⅜-in. holes, 2 in. deep; two holes for 5/16-in. ream; two 3/16-in. holes; one ¼-in. hole; L. H. bank. *Equipment-45 deg L. H. upper angle unit #15.*

A machine that thinks—the crankshaft balancer. The scales direct the attached drilling machine in bringing the shaft into proper balance.



Drill two 3/8-in. holes 2 in. deep; two holes for 5/16-in. ream; one 3/16-in. hole marked *B*; two 1/4-in. holes marked *W*; R. H. bank. *Equipment-45 deg R. H. upper angle unit #16.*

11—360-deg turnover for dumping chips.

12—Rough bore and counter bore four tappet holes, L. H. bank. *Equipment-26 deg L. H. upper angle unit #17.*
Rough bore and counterbore four tappet holes, R. H. bank. *Equipment-26 deg R. H. upper angle unit #18.*

13—Rough bore and counterbore four remaining tappet holes, L. H. bank. *Equipment-26 deg L. H. upper angle unit #19.*
Rough bore and counterbore four remaining tappet holes, R. H. bank. *Equipment-26 deg R. H. upper angle unit #20.*

14—Countersink for 1/2 in.—13 tap ten holes in L. H. bank. *Equipment 45 deg L. H. upper angle unit #21.* Countersink for 1/2 in.—13 tap ten holes R. H. bank. *Equipment-45 deg R. H. upper angle unit #22.*

15—Drill two 3/8-in. holes 4 in. deep; countersink two holes for 5/16-in. ream; L. H. bank. *Equipment-45 deg L. H. upper angle unit #23.* Drill two 3/8-in. holes 4 in. deep; countersink two holes for 5/16 ream; R. H. bank. *Equipment-45 deg R. H. upper angle unit #24.*

16—Drill two 3/8-in. holes through, marked *Z*. Ream two 0.3115-0.313-in. holes, L. H. bank. *Equipment-45 deg L. H. upper angle unit #25.*
Drill two 3/8-in. holes through marked *Z*. Ream two 0.3115-0.313-in. holes, R. H. bank. *Equipment-45 deg R. H. upper angle unit #26.*

17—Automatic check to insure tapped holes are drilled.

18—Unload

Operation #90—Mill and drill front and rear block. *Equipment is 12-station Ingersoll milling and drilling unit.*

Station 1—Load and turn block 90 deg.

2—Rough front and rear block. Equipment is four-spindle milling unit for stations 2 and 3.

3—Finish front and rear block.

4 & 5—Drill 32 holes in ends. *Equipment is two-way 32-spindle drilling unit.*

6 & 7—Drill and chamfer holes in ends. *Equipment is two-way 28-spindle drilling and chamfering unit.*

8 & 9—Rough bore center and rear intermediate cam bearings and drill 10 holes and ream 2 holes in ends. *Equipment is two-way 10-spindle drilling and boring unit.*

10—Trepan two grooves and chamfer corner of trepanned grooves in front end. *Equipment is one-way 4-spindle trepanning and chamfering unit.*

11—Blow chips out of drilled holes.

12—Inspect holes drilled in ends.

Operation #100—Drill all angular oil holes and all miscellaneous holes from pan side. Turn over; drill all miscellaneous holes in banks and top. *Machine—Greenlee 21-station automatic transfer drilling machine.*

Station 1—Load pan rail, upper front end leading.

2—Drill two 5/16-in. holes for 3/8-16 tap and drill one 1/2 in. hole half depth, L. H. head. *Equipment-L. H. horizontal unit #1.*
Drill four 1/4-in. holes, half depth, in main bearings, R. H. head. *Equipment-71 deg R. H. upper angle unit #2.*

3—Drill one 1/2-in. hole 1/3 depth for oil filter and drill two 5/16-in. holes for 3/8-16 tap, L. H. head. *Machine is L. H. horizontal unit #3.*
Drill four 1/4-in. holes, half depth, in main bearings, R. H. head. *Equipment-71 deg R. H. upper angle unit #4.*

4—Countersink two holes for 3/8 in.-16 tap. Drill one 1/2-in. hole 5 1/2 deep, L. H. Head. *Equipment L. H. horizontal unit #5.*
Drill one 1/4-in. hole, half

The camshaft conveyor line; part of the materials handling operation in De Soto's advanced production system.

depth, #5 main bearing, R. H. head. *Equipment 13 deg 30 min. R. H. side angle unit #6.*

5—Drill one ¼-in. hole, half depth (in oil filter), L. H. Head.
Drill one ¼-in. hole, half depth, front main bearing, L. H. head. *Machine —L. H. horizontal unit #7.*

6—Drill three holes 1.6225-1.6255-in. through (plug holes).
Drill one 7/16-in. hole for ¼-in. pipe tap (drain), L. H. head. *Machine is 45 deg L. H. upper angle unit #9.*
Drill three holes 1.6225-1.6255-in. (plug holes).
Drill one 7/16-in. hole for ¼-in. pipe tap (drain). R. H. head. *Equipment—45 deg R. H. upper angle unit #10.*

7—Idle

8—Drill one ¼-in. hole 3¼ in. deep angle hole (filter). *Equipment—L. H. horizontal unit #11.*
Drill one ¼-in. hole 4¾ in. deep (front main bearings) L. H. head. *Equipment—71 deg upper unit #12.*
Drill one 15/32-in. hole for 0.487-0.488-in. ream (oil pump), R. H. head. *Equipment—vertical drill unit #13*

9—Countersink 2 holes for ⅜-16 tap. Drill one ½-in. hole 2/3 depth for oil filter. L. H. head. *Equipment—L. H. horizontal unit #14.*
Drill one ¼-in. hole 4¼ in. deep for #5 main bearing. R. H. head. Equipment—*13 deg 30 min R. H. side angle unit #15.*

10—Drill ½-in. hole to 7¾-in. depth (oil filter). L. H. head. *Equipment—L. H. horizontal unit #16.*
Drill one 17/32-in. counter-drilled hole ⅝ in. deep (oil pump hole). Ream one 0.5625 hole. R. H. head. *Equipment—R. H. vertical unit #17.*

11—Drill one 9/32-in. hole 1/3 depth (depth-stick hole) L. H. head. *Equipment 88 deg L. H. upper angle unit #18.*

12—180-deg turnover, pan rail down.

13—Core drill one 1.999-2.0005-in. hole. *Equipment L. H. vertical unit #19.*
Drill one ¼-in. hole 1/3 depth, L. H. head. *Equipment—L. H. comp angle —Unit #20.*
Drill one ¼-in. hole 1/3 depth, R. H. head. *Equipment—R. H. comp angle unit #21.*

14—Drill one 21/32-in. hole through for 0.6865-in. ream. *Equipment—L. H. vertical unit #22.*
Drill one ¼-in. hole 2/3 depth, L. H. head. *Equipment—L. H. comp angle unit #23.*
Drill one ¼-in. hole 2/3 depth, R. H. head. *Equipment—R. H. comp angle unit #24.*

15—Counterbore one 1⅛-in. diam hole (top of distributor shaft hole). *Equipment L. H. vertical unit #25.*
Drill one ¼-in. hole 6 in. depth, L. H. head. Equipment—L. H. compound angle unit #26.
Drill one ¼-in. hole 6 in. depth, R. H. head. *Equipment—R. H. comp angle unit #27.*

16—Drill one 9/32-in. hole 2/3 depth (depthstick hole). Equipment—88 deg L. H. upper angle unit #28. Two 1-1/32-in. diam trepan (oil filter pad). *Equipment—R. H. horizontal unit #29, two-drill spindles.*

17—Drill one 9/32-in. hole through to intersect hole from bottom (depthstick hole). *Equipment—88 deg L. H. upper angle unit #30.* One 25/32-in. diam trepan, 13 deg 30 min. angle hole, R. H. head. *Equipment—R. H. horizontal unit #31.*

18—Drill six ¼-in. holes for 5/16-18 tap. Drill three ¼-in. holes for 5/16-18 tap. Drill one 11/32-in. hole 2 in. deep.
Countersink top of distributor shaft hole. *Equipment—L. H. vertical unit #32.*

19—Countersink 9 holes for 5/16-18 tap. Drill one 11/32-in. hole to 4-in. depth. Countersink top of oil pump shaft hole. Countersink 1/16 in. by 90 deg depthstick hole (to be done vertically). *Equipment—L. H. vertical unit #33.*

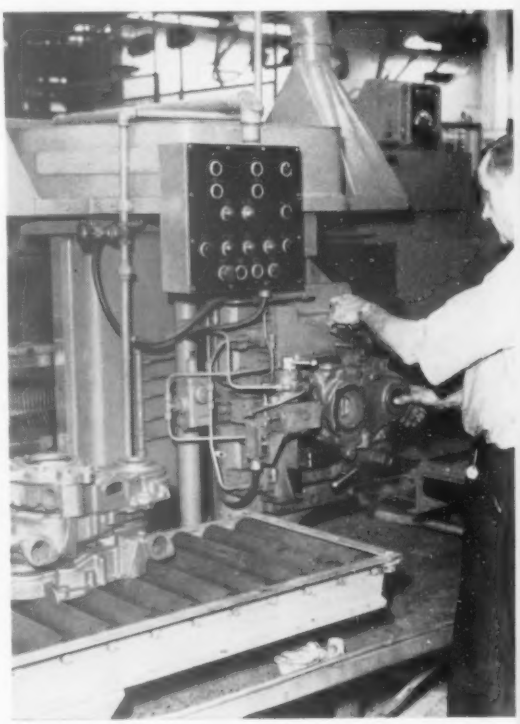
20—Automatic check to insure tapped holes are drilled.

21—Unload

Operation #110—Finish drill and ream miscellaneous holes and tap block complete. *Machine — Greenlee 16-station automatic transfer drilling and tapping machine.*

Station 1—Load
2—Ream four 0.895-in. holes, L. H. head. *Equipment—26 deg L. H. upper angle*

Individual inserted-type carbide cutters in this broach contribute to fast, low-cost tool maintenance.



unit #1. Ream four 0.895-in. holes, R. H. head. *Equipment—26 deg R. H. upper angle unit #2*

3—Ream four 0.895-in. holes, L. H. head. *Equipment—26 deg L. H. upper angle unit #3.* Ream four 0.895-in. holes, R. H. head. *Equipment—26 deg R. H. upper angle unit #4.*

4—Idle

5—Ream four 0.905-0.9055-in. tappet holes, L. H. head. *Equipment—26 deg L. H. upper angle unit #5.*
Ream four 0.905-0.9055-in. tappet holes, R. H. head. *Equipment—26 deg R. H. upper angle unit #6.*

6—Ream four 0.905-0.9055-in. tappet holes, L. H. head. *Equipment—26 deg R. H. upper angle unit #7.*
Ream four 0.905-0.9055-in. tappet holes, R. H. head. *Equipment—26 deg R. H. upper angle unit #8.*

7—Idle

8—Ream one 0.3615-0.363-in. hole, L. H. head. *Equipment 88 deg L. H. upper angle unit #9.*
Tap ten ½-13 holes, R. H. head. *Equipment—45 deg R. H. upper angle unit #10.*

9—Tap ten ½-13 holes, L. H. head. *Equipment—45 deg L. H. upper angle unit #11.* Quick approach.
Tap three 5/16-18 holes; tap six 5/16-18 holes; tap one ⅛-in. pipe tap hole, R. H. head. *Machine—45 deg R. H. upper angle unit #11.*

10—180-deg turnover. Fixture ture pan rail up.

11—Tap four ⅜-16 holes in filter pad, L. H. head. *Equipment—L. H. horizntal unit #13.*
Tap twenty-two 5/16-18 holes (pan rail).
Tap ten ½-13 holes (Bearing cap).
Tap two ¼-in. pipe tap holes, 45 deg angle. *Equipment—R. H. vertical unit #14.*

12—Rotate block 90 deg, rear end to left hand side.

13—Idle

14 & 15—Tap two ⅜-in. pipe tap holes. Tap two ⅜-16 holes. Tap one 7/16-14 hole. L. H. head. Tap one ½-in. OD pipe tap hole. Tap three ⅜-16 holes. L. H. head. *Equipment—L. H. horizontal unit #15.* Tap nine ⅜-16 holes. Tap four 5/16-18 holes. R. H. head. *Equipment—R. H. horizontal unit #16.*

16—Unload

Cylinder Head

Operation #50—Broach intake face, notch, top, exhaust face and bottom. *Cincinnati 2-way horizontal broach.*

Station 1—Load

2—Rough and finish broach top and intake side including 5/16 in. notch.

3—Turn over

4—Rough and finish broach exhaust face and bottom face.

Operation #60—Mill transfer pads; drill and ream holes in top and bottom. *Foote-Burt, 15-station, 95-spindle drilling and reaming automatic transfer machine.*

Station 1—Load part intake side down, combustion chamber side to right.

2—Drill three 23/32-in. holes ⅝ in. deep; drill two 23/32-in. holes ¼ in. deep; core drill two 1-⅛ in. diam holes L. H. head. *L. H. head unit #1.*
—Mill 2 pads on each end for transferring (R. H. head); locate from cored spark hole. *R. H. horizontal unit # 2.*

3—Ream two 0.7535-0.7545-in. diam holes ⅝ in. deep. Ream two 0.7565-0.7585-in. diam holes ¼ in. deep. Ream two 1.156-in. diam holes through. *L. H. horizontal unit #3.*
—drill two 5/16-in. diam holes 1-½ in. deep—first pass. *R. H. 20 deg below horizontal unit #4.*

4—Idle

5—Ream one 0.7535-0.7545-in hole; core drill four spark plug holes to 1-5/32-in. diam x 2-1/16 in. deep; chamfer two holes. *L. H. horizontal unit #5.* Drill ten 17/32-in. bolt holes (half depth). *R. H. horizontal unit #6.*

6—Drill four spark plug holes to 15/32-in. diam; drill six ¼-in. holes 13/16 in. deep. Chamfer two 0.7535-in. end holes. *L. H. horizontal unit #7.* Drill six ⅜-in. diam holes.
Drill six ¼-in. diam holes.
Drill two 11/32-in diam holes for 0.3755-in. dowels.
Drill two 5/16-in. diam holes.
Drill two 11/32-in diam holes. *R. H. horizontal unit #8.*

7—Idle

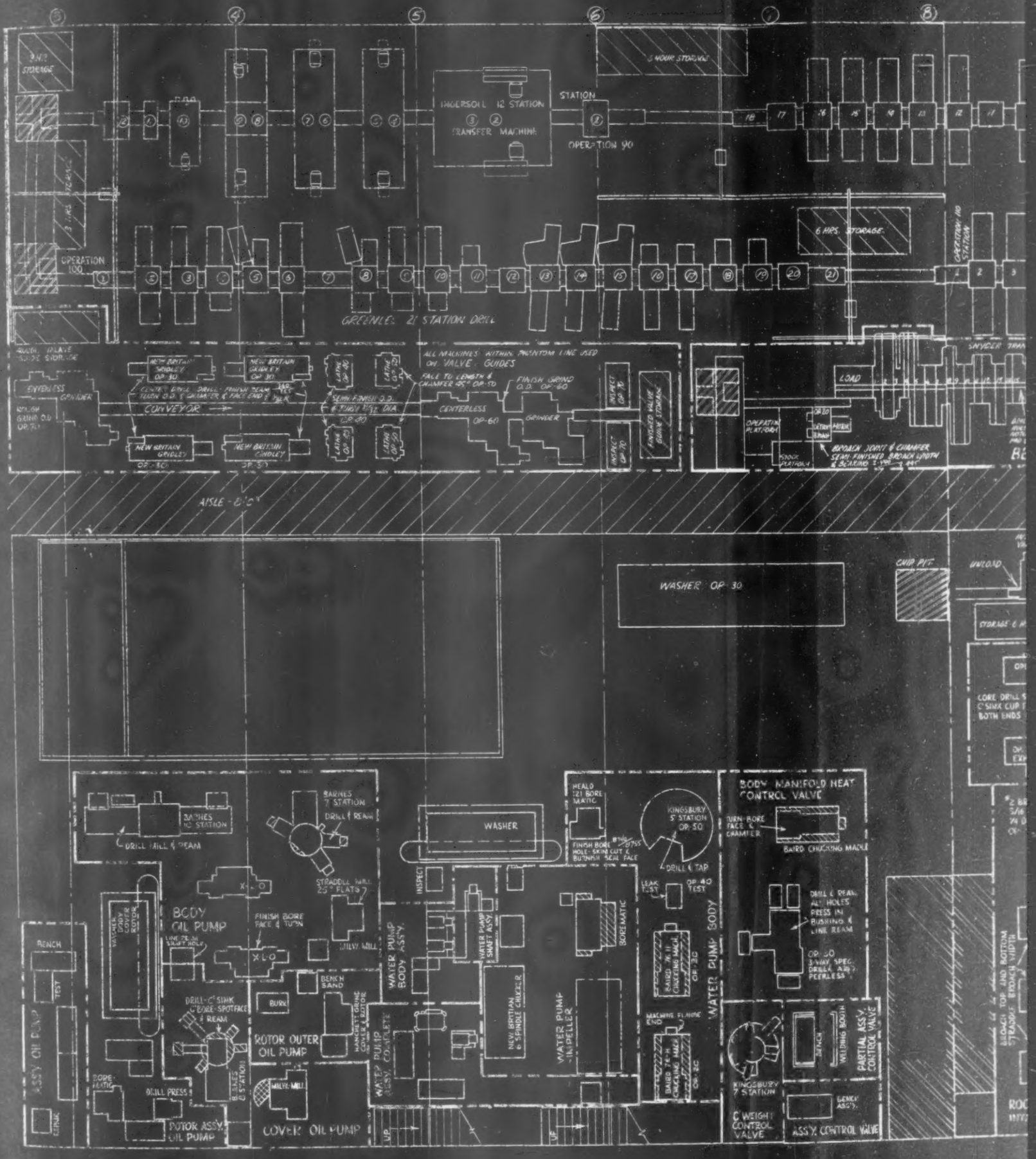
8—Rough, counterbore and chamfer four 1.249 in. spark plug holes and chamfer six 5/16 in. tap holes. *L. H. horizontal unit #9.* Drill nine 17/32-in. bolt holes through. Center *W* hole not drilled here. *R. H. unit #10*

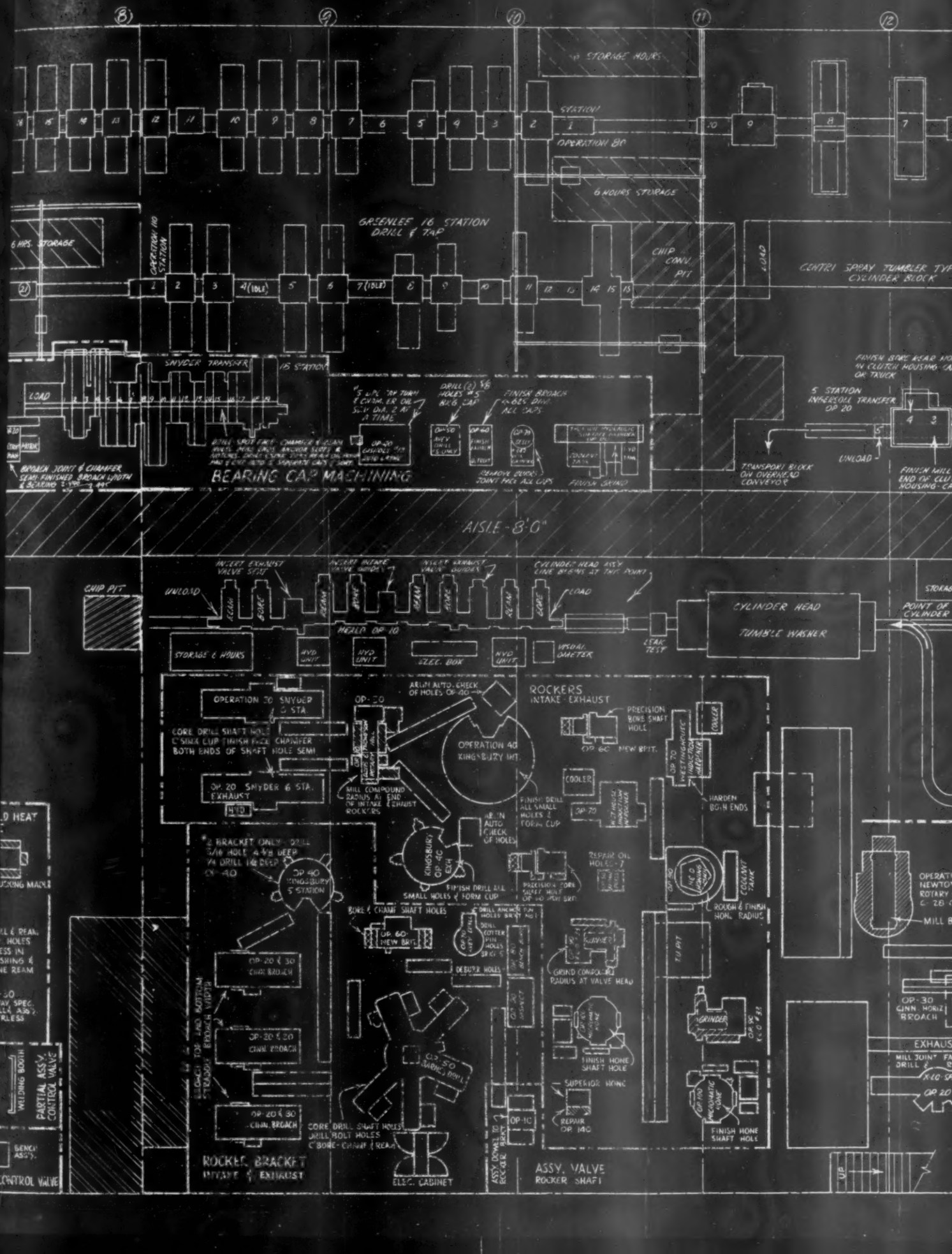
9—Ream four 14 MM-T spark plug holes 0.519-0.521-in. PD; chamfer one 0.7535 in. reamed hole. *L. H. horizontal unit #11.* Ream and chamfer two 0.5625-in. holes (T)-outside holes for locating on Heald. *R. H. horizontal unit #12.*

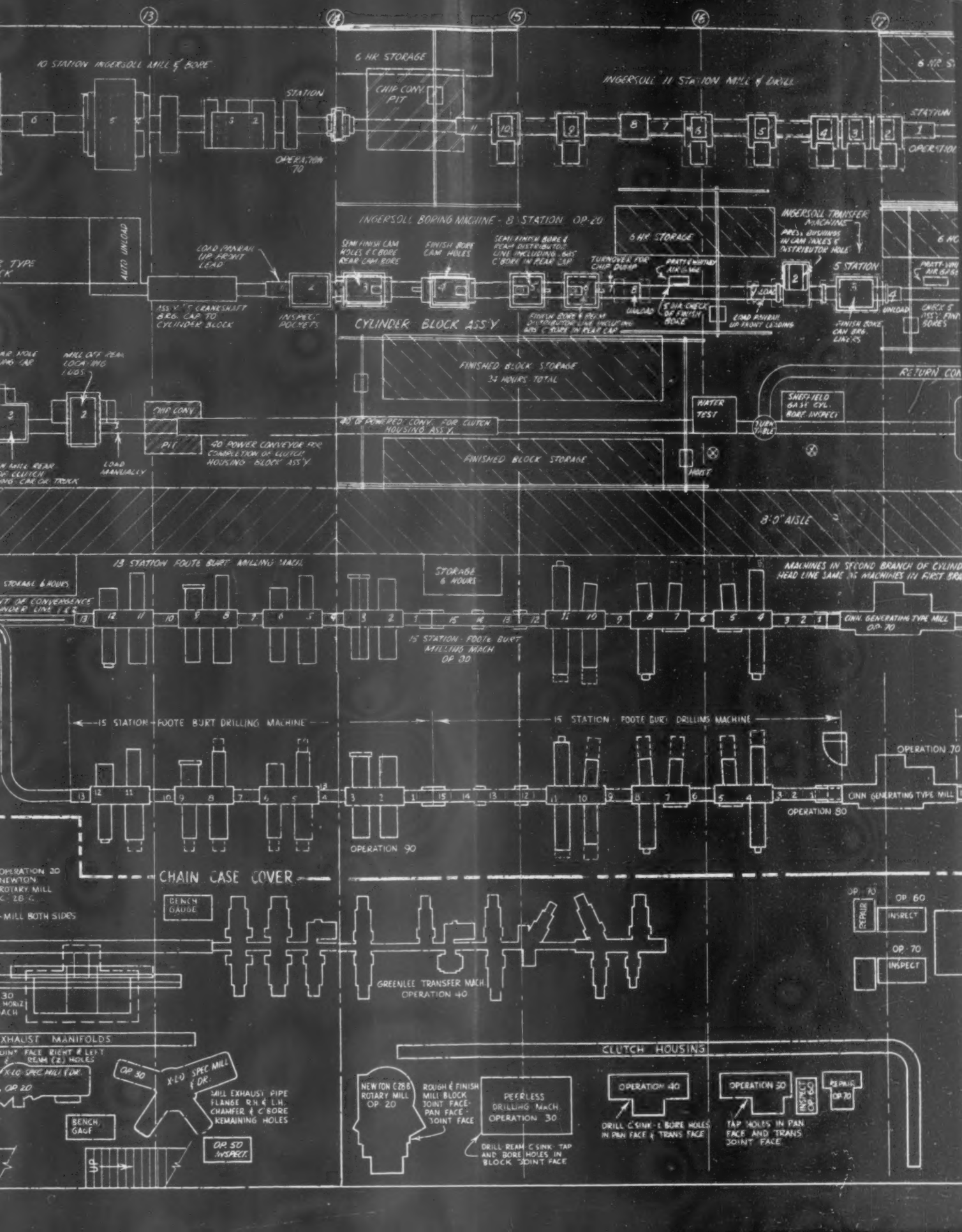
10—Idle

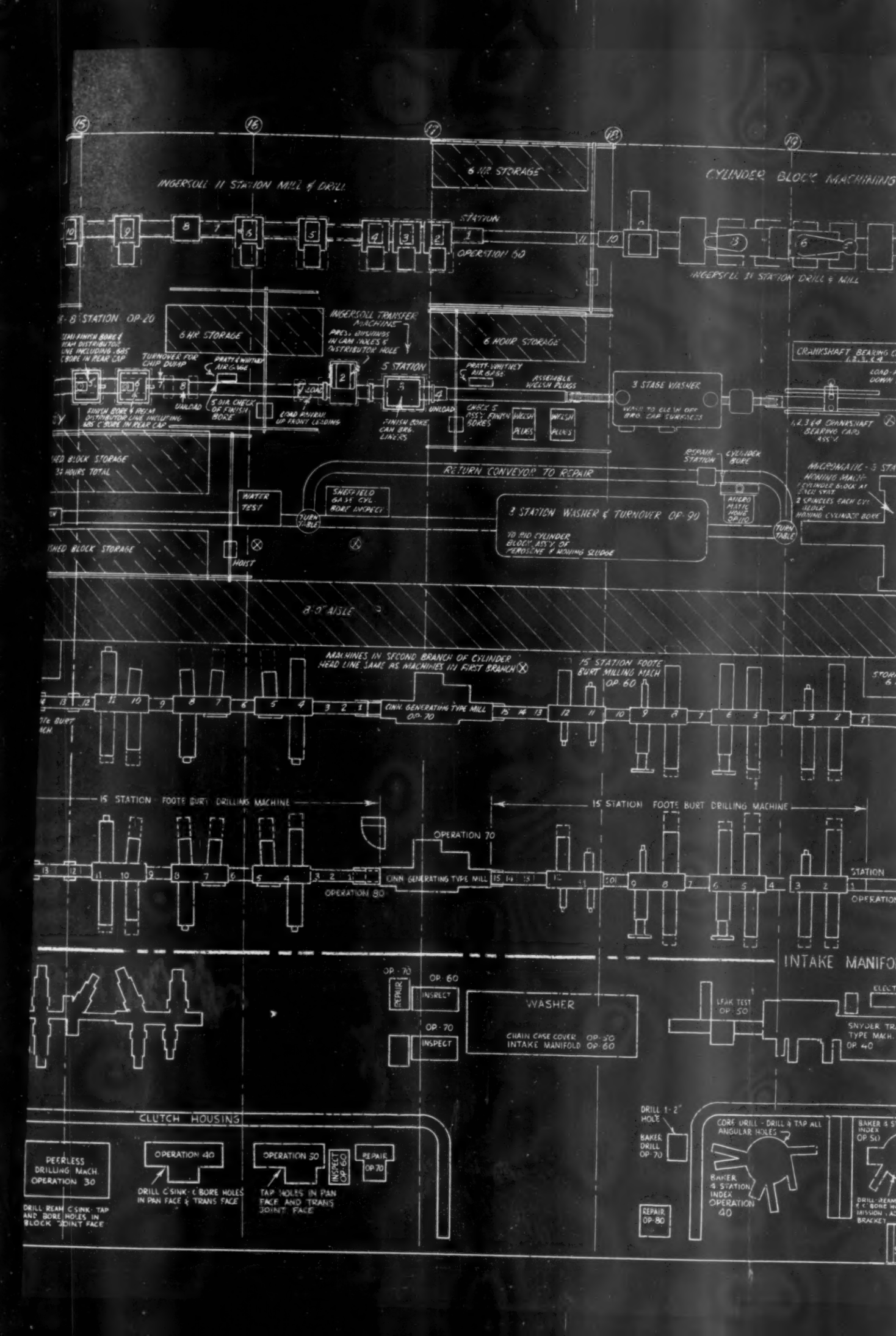
11—Drill ¼-in. diam hole ½ depth. *L. H. horizontal unit #13.*
Drill two 5/16-in. diam holes through. *R. H. 20*

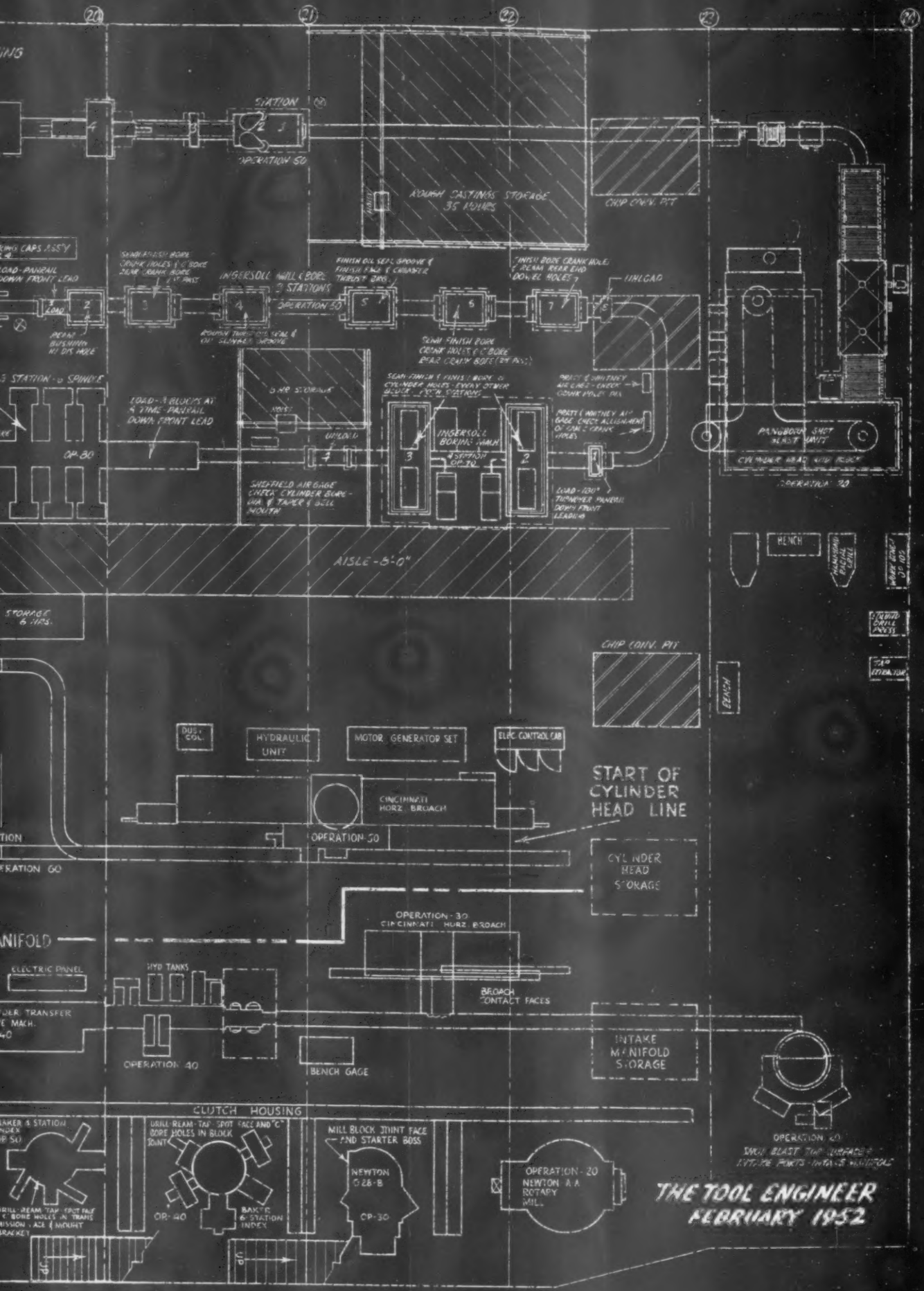
Advanced plant layout of De Soto's automatized engine plant is seen in the print at right. Among the parts produced in this section of the plant are the cylinder block, cylinder head, intake manifold, and the chain case cover. These operations are described in detail in the text and can be followed on the chart. Operations not included in the text are explained on the print.

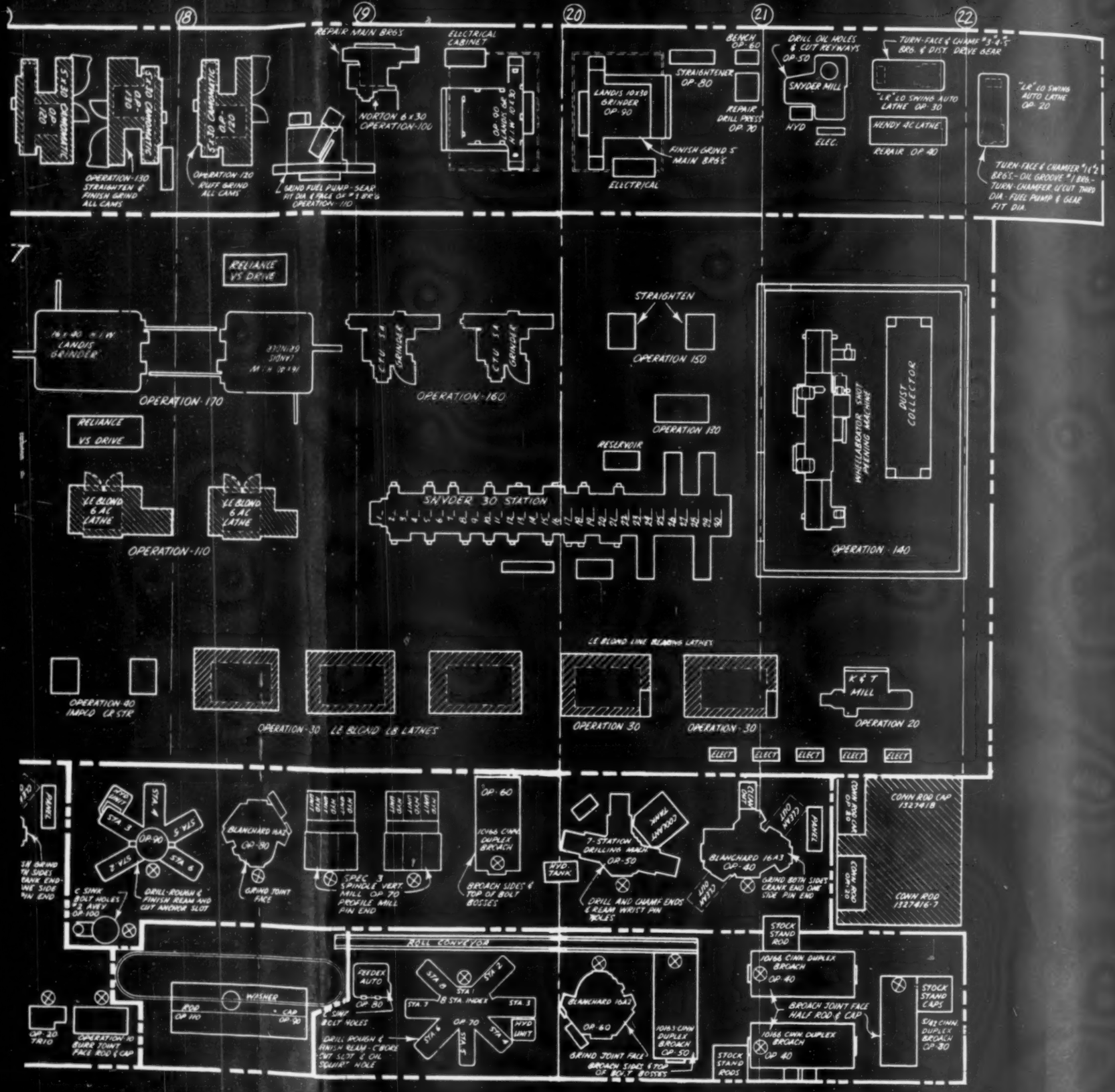

3 HR. STORAGE
INGERSOLL 12 STATION
TRANSFER MACHINE
OPERATION 90
6 HOUR STORAGE
OPERATION 100
GREENLEE 21 STATION DRILL
ALL MACHINES WITHIN PHANTOM LINE USED ON VALVE GUIDES
NEW BRITAIN GRIDLEY OP. 30
NEW BRITAIN GRIDLEY OP. 40
NEW BRITAIN GRIDLEY OP. 50
LATHE OP. 60
LATHE OP. 70
CONVEYOR
CENTERLESS GRINDER OP. 60
INSPECT OP. 70
FINISHED VALVE GUIDE STORAGE
OPERATION PLATFORM
BROACH JOINT & CHAMFER
LOAD
AISLE - B'CY
WASHER OP. 30
CHIP PIT
UNLOAD
BODY OIL PUMP
BARNES 7 STATION
BARNES 10 STATION
DRILL & REAM
STRADDLE MILL 25° FLATS
FINISH BORE FACE & TURN
LINE REAM SHAFT HOLE
BENCH
TEST
ASSY OIL PUMP
BENCH SAND
BURR
DRILL-C'SINK C'BORE-SPOTFACE & REAM
ROTOR OUTER OIL PUMP
DRILL PRESS
ROTOR ASSY. OIL PUMP
COVER OIL PUMP
WATER PUMP BODY ASSY.
WATER PUMP SHAFT ASSY.
WATER PUMP IMPELLER
WASHER
INSPECT
HEALD 121 BORE MATIC
FINISH BORE HOLE-SKIN CUT & BURNISH SEAL FACE
KINGSBURY 5 STATION OP. 50
DRILL & TAP
LEAK TEST OP. 40 TEST
BORE MATIC
BAIRD 76 H CHUCKING MACH. OP. 30
NEW BRITAIN 6 SPINDLE CHUCKER
BAIRD 76 H CHUCKING MACH. OP. 30
MACHINE FLAME END
BODY MANIFOLD HEAT CONTROL VALVE
TURN BORE FACE & CHAMFER
BAIRD CHUCKING MACH.
DRILL & REAM ALL HOLES PRESS IN BUSHING & LINE REAM
OP. 30 3-WAY SPEC. DRILL AND PEERLESS
WATER PUMP BODY
PARTIAL ASSY. CONTROL VALVE
WELDING BOOTH
BENCH
KINGSBURY 7 STATION
C WEIGHT CONTROL VALVE
BENCH ASSY.
ASSY. CONTROL VALVE
STORAGE


8
9
10
11
12
STORAGE HOURS
STATION
OPERATION 80
6 HOURS STORAGE
GRSENLEE 16 STATION DRILL & TAP
CHIP CONV. PIT
LOAD
CENTRI SPRAY TUMBLER TYP
CYLINDER BLOCK
SNYDER TRANSFER
15 STATION
LOAD
DRILL (2) 5/8 HOLES #5 BRG CAP
FINISH BROACH MAIN BRG CAPS
BROACH JOINT & CHAMFER
BEARING CAP MACHINING
5 STATION INGERSOLL TRANSFER OP 20
UNLOAD
TRANSPORT BLOCK ON OVERHEAD CONVEYOR
AISLE - 8'-0"
INSERT EXHAUST VALVE SEAT
INSERT INTAKE VALVE GUIDES
INSERT EXHAUST VALVE GUIDES
CYLINDER HEAD ASSY LINE BEGINS AT THIS POINT
CHIP PIT
UNLOAD
LOAD
CYLINDER HEAD TUMBLE WASHER
HEAD OP. 10
STORAGE 6 HOURS
HYD. UNIT
ELEC. BOX
VISUAL OMETER
LEAK TEST
OPERATION 30 SNYDER 6 STA.
CORE DRILL SHAFT HOLE C'SINK CUP FINISH FACE CHAMFER BOTH ENDS OF SHAFT HOLE SEMI
OP. 20 SNYDER 6 STA. EXHAUST
OP-30
ARLIN AUTO. CHECK OF HOLES OP 40
OPERATION 40 KINGSBURY INT.
MILL COMPOUND RADIUS AT END OF INTAKE & EXHAUST ROCKERS
ROCKERS INTAKE - EXHAUST
PRECISION BORE SHAFT HOLE
OP 60 NEW BRIT.
COOLER
FINISH DRILL ALL SMALL HOLES & FORM CUP
HARDEN BOTH ENDS
ARLIN AUTO CHECK OF HOLES
KINGSBURY OP 40 EXH
FINISH DRILL ALL SMALL HOLES & FORM CUP
PRECISION CORE SHAFT HOLE OP 40 KING BRG
REPAIR OIL HOLES - 7
ROUGH & FINISH HONE RADIUS
COOLANT TANK
OP 40 KINGSBURY 5 STATION
BORE & CHAMF SHAFT HOLES
OP. 60 NEW BRIT.
DEBURR HOLES
GRIND COMPOUND RADIUS AT VALVE HEAD
GRINDER
OP-20 & 30 CINN BROACH
OP-20 & 30 CINN BROACH
OP-20 & 30 CINN. BROACH
OP-30 CINN. HORIZ BROACH
FINISH HONE SHAFT HOLE
SUPERIOR HONE
REPAIR OP 140
FINISH HONE SHAFT HOLE
CORE DRILL SHAFT HOLES DRILL BOLT HOLES C'BORE - CHAMF & REAM
ROCKER BRACKET INTAKE & EXHAUST
ELEC. CABINET
ASSY. VALVE ROCKER SHAFT
PARTIAL ASSY. CONTROL VALVE
CONTROL VALVE
WELDING BOOTH
BENCH ASSY.


10 STATION INGERSOLL MILL & BORE
6 HR STORAGE
CHIP CONV. PIT
INGERSOLL 11 STATION MILL & DRILL
INGERSOLL BORING MACHINE - 8 STATION OP. 20
6 HR STORAGE
INGERSOLL TRANSFER MACHINE
5 STATION
CYLINDER BLOCK ASS'Y
FINISHED BLOCK STORAGE 34 HOURS TOTAL
FINISHED BLOCK STORAGE
40' POWER CONVEYOR FOR COMPLETION OF CLUTCH HOUSING BLOCK ASS'Y
WATER TEST
SHEFFIELD GAGE CYL. BORE INSPECT
RETURN CON
8'-0" AISLE
13 STATION FOOTE BURT MILLING MACH
STORAGE 6 HOURS
15 STATION FOOTE BURT MILLING MACH OP. 30
MACHINES IN SECOND BRANCH OF CYLINDER HEAD LINE SAME AS MACHINES IN FIRST BRANCH
CINN GENERATING TYPE MILL O.P. 70
15 STATION FOOTE BURT DRILLING MACHINE
15 STATION FOOTE BURT DRILLING MACHINE
OPERATION 70
CINN GENERATING TYPE MILL
OPERATION 80
OPERATION 90
CHAIN CASE COVER
BENCH GAUGE
GREENLEE TRANSFER MACH. OPERATION 40
OP. 10 REPAIR
OP. 60 INSPECT
OP. 70 INSPECT
EXHAUST MANIFOLDS
OP. 30
X-L-O SPEC MILL & DR.
MILL EXHAUST PIPE FLANGE R.H. & L.H. CHAMFER & C'BORE REMAINING HOLES
BENCH GAUGE
OP. 50 INSPECT
CLUTCH HOUSINS
NEWTON C.28.B. ROTARY MILL OP. 20
ROUGH & FINISH MILL BLOCK JOINT FACE PAN FACE JOINT FACE
PEERLESS DRILLING MACH. OPERATION 30
DRILL REAM C'SINK TAP AND BORE HOLES IN BLOCK JOINT FACE
OPERATION 40
DRILL C'SINK & BORE HOLES IN PAN FACE & TRANS FACE
OPERATION 50
TAP HOLES IN PAN FACE AND TRANS JOINT FACE
INSPECT OP. 60
REPAIR OP. 70


INGERSOLL 11 STATION MILL & DRILL
6 HR. STORAGE
CYLINDER BLOCK MACHINING
STATION
OPERATION 80
INGERSOLL 11 STATION DRILL & MILL
8 STATION OP. 20
6 HR. STORAGE
INGERSOLL TRANSFER MACHINE
6 HOUR STORAGE
5 STATION
PRATT WHITNEY AIR GAGE
ASSEMBLE WELSH PLUGS
3 STAGE WASHER
CRANKSHAFT BEARING
TURNOVER FOR CHIP DUMP
UNLOAD
LOAD
FINISH BORE & REAM DISTRIBUTOR LINE INCLUDING .685 C'BORE IN REAR CAP
5 DIA. CHECK OF FINISH BORE
LOAD REVERSE UP FRONT LOADING
FINISH BORE CAM BRG. LINERS
CHECK 5 ASSY. FINISH BORES
WELSH PLUGS
WELSH PLUGS
LOAD
DOWN
1,2,3 & 4 CRANKSHAFT BEARING CAPS ASS'Y
HED BLOCK STORAGE
24 HOURS TOTAL
RETURN CONVEYOR TO REPAIR
REPAIR STATION
CYLINDER BORE
MICROMATIC - 3 STA
HONING MACH
WATER TEST
SHEFFIELD GAGE CYL. BORE INSPECT
TURN TABLE
3 STATION WASHER & TURNOVER OP. 90
TO RID CYLINDER BLOCK ASS'Y OF KEROSENE & HONING SLUDGE
AMERO MATIC HONE OP. 100
TURN TABLE
HOIST
8'-0" AISLE
MACHINES IN SECOND BRANCH OF CYLINDER HEAD LINE SAME AS MACHINES IN FIRST BRANCH
15 STATION FOOTE BURT MILLING MACH OP. 60
CINN GENERATING TYPE MILL OP. 70
15 STATION FOOTE BURT DRILLING MACHINE
OPERATION 70
OPERATION 80
STATION
OPERATION
INTAKE MANIFO
OP. 70
REPAIR
OP. 60
INSPECT
OP. 70
INSPECT
WASHER
CHAIN CASE COVER OP. 30
INTAKE MANIFOLD OP. 60
LEAK TEST OP. 50
ELECT
SNYDER TR
TYPE MACH.
OP. 40
CLUTCH HOUSING
PEERLESS DRILLING MACH. OPERATION 30
DRILL REAM C'SINK - TAP AND BORE HOLES IN BLOCK JOINT FACE
OPERATION 40
DRILL C'SINK - C'BORE HOLES IN PAN FACE & TRANS FACE
OPERATION 50
TAP HOLES IN PAN FACE AND TRANS JOINT FACE
INSPECT OP. 60
REPAIR OP. 70
DRILL 1-2" HOLE
BAKER DRILL OP. 70
CORE DRILL - DRILL & TAP ALL ANGULAR HOLES
BAKER 4 STATION INDEX OPERATION 40
REPAIR OP. 80
BAKER 4 STATION INDEX OP. 50


20
21
22
23
24
STATION
OPERATION 50
ROUGH CASTINGS STORAGE 35 HOURS
CHIP CONV. PIT
INGERSOLL MILL & BORE 3 STATIONS
OPERATION 50
FINISH OIL SEPT. GROOVE & FINISH REAR & CRANKER THRUST BRG.
FINISH BORE CRANK HOLE & REAR END DOWEL HOLES
UNLOAD
SEMI FINISH BORE CRANK HOLES & C'BORE REAR CRANK BORE (1ST PASS)
LOAD - 4 BLOCKS AT A TIME - PANRAIL DOWN FRONT LEAD
OP. 80
SHEFFIELD AIR GAGE CHECK CYLINDER BORE - DIA. & TAPER & BELL MOUTH
SEMI-FINISH & FINISH BORE 6 CYLINDER HOLES - EVERY OTHER BLOCK - 5 STATIONS
INGERSOLL BORING MACH. 5 STATION OP. 70
PRATT & WHITNEY AIR GAGE CHECK ALIGNMENT OF FAN & CRANK HOLES
LOAD - 12 AT A TIME - PANRAIL DOWN FRONT LEADIN
PANGBORN SHOT BLAST UNIT
CYLINDER HEAD WITH TRUCK
OPERATION 70
AISLE - 8'-0"
BENCH
STORAGE 6 HRS.
CHIP CONV. PIT
DUST COL.
HYDRAULIC UNIT
MOTOR GENERATOR SET
ELEC. CONTROL CAB
CINCINNATI HORZ. BROACH
OPERATION 50
START OF CYLINDER HEAD LINE
CYLINDER HEAD STORAGE
OPERATION 60
OPERATION 30
CINCINNATI HORZ. BROACH
BROACH CONTACT FACES
ELECTRIC PANEL
HYD TANKS
OPERATION 40
BENCH GAGE
INTAKE MANIFOLD STORAGE
CLUTCH HOUSING
DRILL-REAM-TAP-SPOT FACE AND C'BORE HOLES IN BLOCK JOINT
MILL BLOCK JOINT FACE & END STARTER BOSS
NEWTON G 28-B
OP. 30
OP. 40
BAKER 6 STATION INDEX
OPERATION 20
NEWTON A-A ROTARY MILL
OPERATION 20
THE TOOL ENGINEER
FEBRUARY 1952


18
19
20
21
22
OPERATION-130 STRAIGHTEN & FINISH GRIND ALL CAMS
OPERATION-120 RUFF GRIND ALL CAMS
GRIND FUEL PUMP-GEAR FIT DIA & FACE OF #1 BRG OPERATION-110
REPAIR MAIN BRGS
NORTON 6 x 30 OPERATION-100
ELECTRICAL CABINET
BEACH OP-60
STRAIGHTENER OP-80
LANDIS 10x30 GRINDER OP-90
REPAIR DRILL PRESS OP-70
FINISH GRIND 5 MAIN BRGS.
ELECTRICAL
DRILL OIL HOLES & CUT KEYWAYS OP-50
SNYDER MILL
HYD
ELEC.
TURN-FACE & CHAMFER "5" BRG. & DIST. DRIVE GEAR
"LR" LO SWING AUTO LATHE OP-30
HENDY 4C LATHE
REPAIR OP-40
"LR" LO SWING AUTO LATHE OP-20
TURN-FACE & CHAMFER "1 1/2" BRGS-OIL GROOVE "1" BRG-TURN-CHAMFER U'CUT THRD DIA-FUEL PUMP & GEAR FIT DIA.
RELIANCE VS DRIVE
16 x 40 "L" IV LANDIS GRINDER
OPERATION-170
CTU 54 GRINDER
CTU 54 GRINDER
OPERATION-160
STRAIGHTEN
OPERATION 150
OPERATION 130
RESERVOIR
SNYDER 30 STATION
WHEELABRATOR SHOT PEENING MACHINE
DUST COLLECTOR
OPERATION-140
RELIANCE VS DRIVE
LE BLOND 6 AC LATHE
LE BLOND 6 AC LATHE
OPERATION-110
LE BLOND LINE BORING LATHES
OPERATION-40 IMPCO QR STR
OPERATION-30 LE BLOND LB LATHES
OPERATION 30
OPERATION-30
K & T MILL
OPERATION 20
ELECT
ELECT
ELECT
ELECT
ELECT
PANEL
OP-90
STA 1
STA 2
STA 3
STA 4
STA 5
C SINK BOLT HOLES & AVEY OP-100
DRILL-ROUGH & FINISH REAM AND CUT ANCHOR SLOT
BLANCHARD 16A2 OP-80
GRIND JOINT FACE
SPEC. 3 SPINDLE VERT. MILL OP-70 PROFILE MILL PIN END
OP-60
10V66 CINN DUPLEX BROACH
BROACH SIDES & TOP OF BOLT BOSSES
7-STATION DRILLING MACH OP-50
HYD TANK
DRILL AND CHAMF ENDS & REAM WRIST PIN BOLES
CLAMP
CLEAN OUT
PANEL
BLANCHARD 16A3 OP-40
GRIND BOTH SIDES CRANK END ONE SIDE PIN END
CONN ROD CAP 132741B
CONN ROD 132741B-7
OP-10 TRIO
OPERATION 10 BURR JOINT FACE ROD & CAP
WASHER
ROD OP 110
CAP OP-90
FEEDEX AUTO OP-80
C SINK BOLT HOLES
DRILL ROUGH & FINISH REAM-C'BORE CUT SLOT & OIL SQUIRT HOLE
8 STA. INDEX OP-70
HYD UNIT
BLANCHARD 16A2 OP-60
GRIND JOINT FACE
10V83 CINN DUPLEX BROACH OP-50
BROACH SIDES & TOP OF BOLT BOSSES
STOCK STAND ROD
10V66 CINN DUPLEX BROACH OP-40
BROACH JOINT FACE HALF ROD & CAP
10V66 CINN DUPLEX BROACH OP-40
STOCK STAND CAPS
STOCK STAND RODS
5V82 CINN DUPLEX BROACH OP-30

deg below horizontal unit #14.

12—Drill one ¼-in. hole through. *L. H. low-angle unit #15.*
Drill one 17/32-in. bolt hole through (*W* center hole) and ream and chamfer two 0.3755-in. holes. *R. H. horizontal unit #16.*

13—Tumble to clear chips and to place bottom up.

14—Idle

15—Unload

peration #70—Form mill combustion chamber (note - machine is connected to preceding drill so that parts can be transferred into load station. Part will then be picked up by transfer bar on this machine and cycled through automatically.) *Cincinnati six-station special mill machine.*

4—First working station—mill two alternate combustion chambers.

5—Mill remaining two combustion chambers.

6—Unload

peration #80—Finish drill, ream and chamfer ends—top and bottom. *Foote-Burt 15-station drilling and reaming automatic transfer machine.*

tion 1—Load

2—Idle

3—Tumble so intake side is down—bottom to right.

4—Drill one ¼-in. hole for 5/16-in. tap (end hole) L. H. head. *L. H. horizontal unit.*
Form counterbore four spark plug holes (in dome)—drill two ¼-in. diam holes—R. H. head. *R. H. horizontal unit—6 drill spindles.*

5—Chamfer one 15/16-in. tap hole (end hole) L. H. head. *L. H. horizontal unit.* Drill four 17/32-in. diam holes (½ depth) R. H. head. *R. H. drilling unit 21 deg below horizontal.*

6—Idle

7—Drill one 5/16 in. tap hole (end hole) L. H. head. *L. H. drill unit.* Drill four 17/32-in. diam holes (½ depth)—R. H. head. *R. H. drill unit 18½ deg below horizontal and 3 deg 40 min side angle.*

8—Chamfer one ¼-in. hole for 5/16-in. tap (end hole) L. H. head. *L. H. horizontal drilling unit.* Drill four 17/32-in. holes through R. H. head. *R. H. drill unit 21 deg below horizontal, 3 deg 25 min side angle.*

9—Idle

10—Finish counterbore four spark plug holes to 1.249 in. diam and chamfer 14-mm hole—L. H. head. *L. H. horizontal drill unit.* Drill four 17/32-in. diam holes through—R. H. head. *R. H. drill unit 18½ deg below horizontal and 3 deg 40 min side angle.*

11—Tap four 14-mm spark plug holes; tap six 5/16-in. holes; tap two 1-in. pipe tap holes;—L. H. head. *L. H. horizontal drill unit.*
Tap two 5/16-18 holes (end holes) R. H. head. *R. H. horizontal drill unit.*

12—Tumble 90 deg so top is up.

13—Idle

14—Idle

15—Eject to station 5 of following machine.

Operation #90—Finish drill, counterbore and tap cylinder head complete. Foote-Burt 13-station, 85-spindle drilling and tapping machine.

Station 1—Load with top up, locate from two 0.7535-in. diam *W* holes in top.

2—Drill four 0.6875-in. *R* holes (Intake valve guide holes) L. H. head. *L. H. upper angle drill unit—27 deg from vertical.*

3—Counterbore four 1-25/64-in. diam intake spring seats—L. H. head. *L. H. upper angle drills unit 26 deg from vertical.*

4—Counterbore four 1-25/64-in. diam exhaust spring seats—R. H. head. *R. H. upper angle drill unit 27 deg from vertical.* Tumble 155 deg to place bottom up at 25-deg angle and side holes horizontal.

5—Rough form and counter drill four intake throats. *L. H. unit 39 deg above horizontal.*
Drill eight ⅜-in. *T* holes (intake side). *R. H. horizontal drill unit.*

6—Drill seven ⅜-in. *T* holes (exhaust side). *L. H. horizontal drill unit.*
Rough counterbore and counter drill four exhaust throats. R. H. upper angle drill unit 2 deg from vertical.

7—Idle

8—Semi-finish four intake throats—L. H. head. *L. H. drill unit 39 deg above horizontal.*

9—Chamfer seven ⅜-in. *T* holes—exhaust holes L. H. head. *L. H. horizontal drill unit.* Semi-finish four exhaust throats. *R. H. upper angle drill unit 2 deg from vertical.*

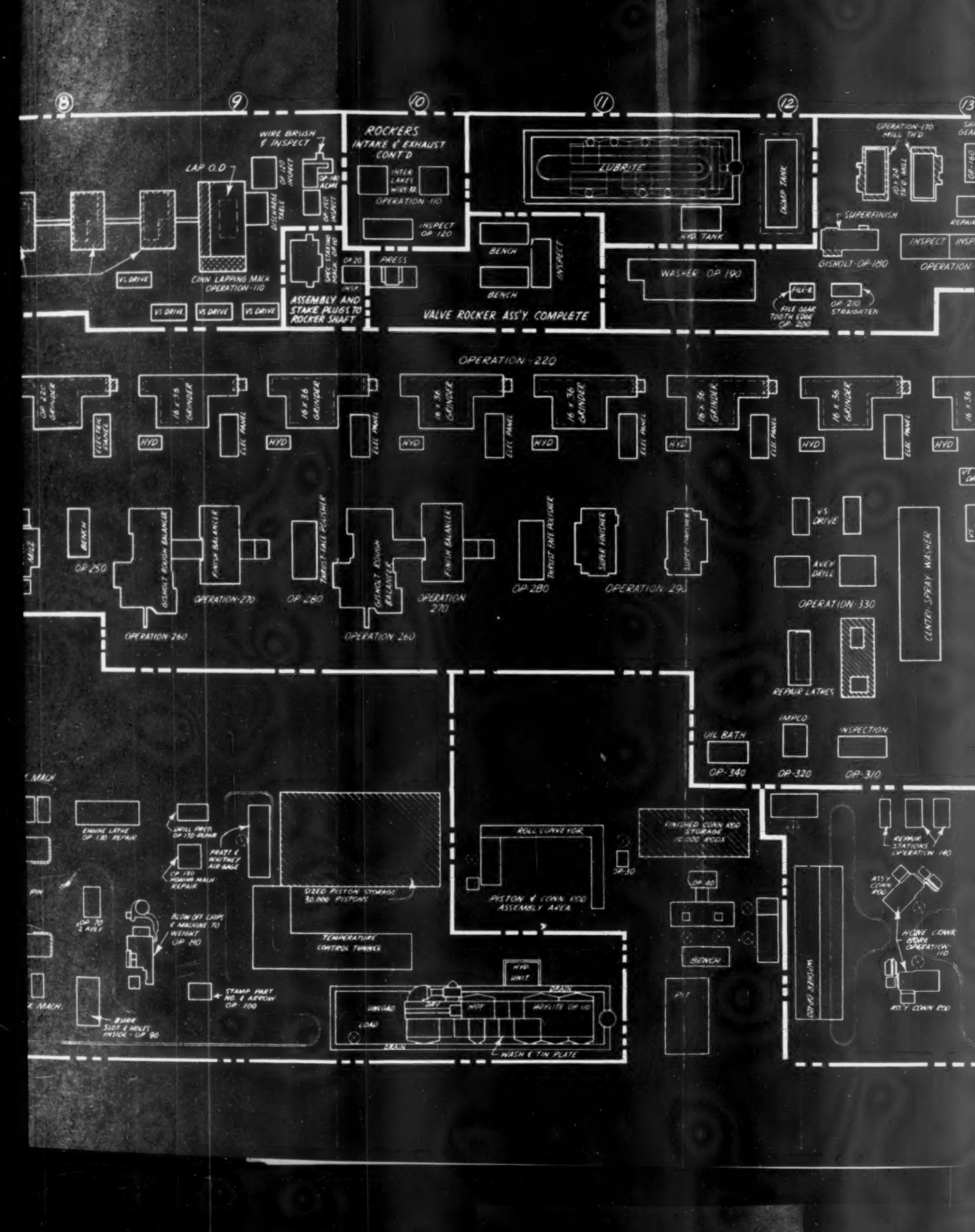
10—Tumble to clear chips.

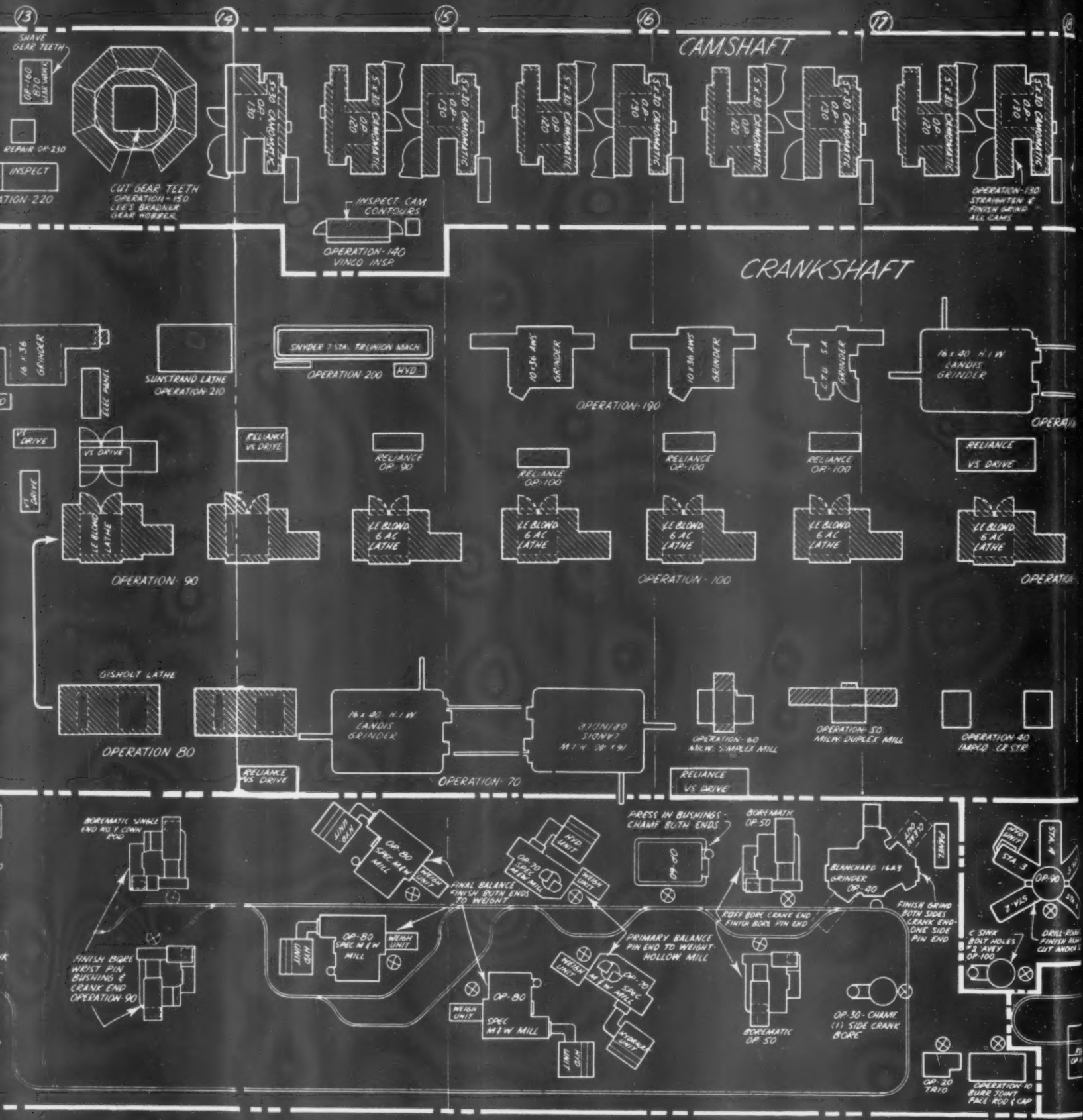
11—Rough ream four 0.6875-in. intake valve guide holes to 0.659 in. L. H. head. *L. H. drill unit 39 deg above horizontal.* Tap eight ⅜-in. *T* holes (intake holes)—R. H. head. *R. H. horizontal drill unit.*

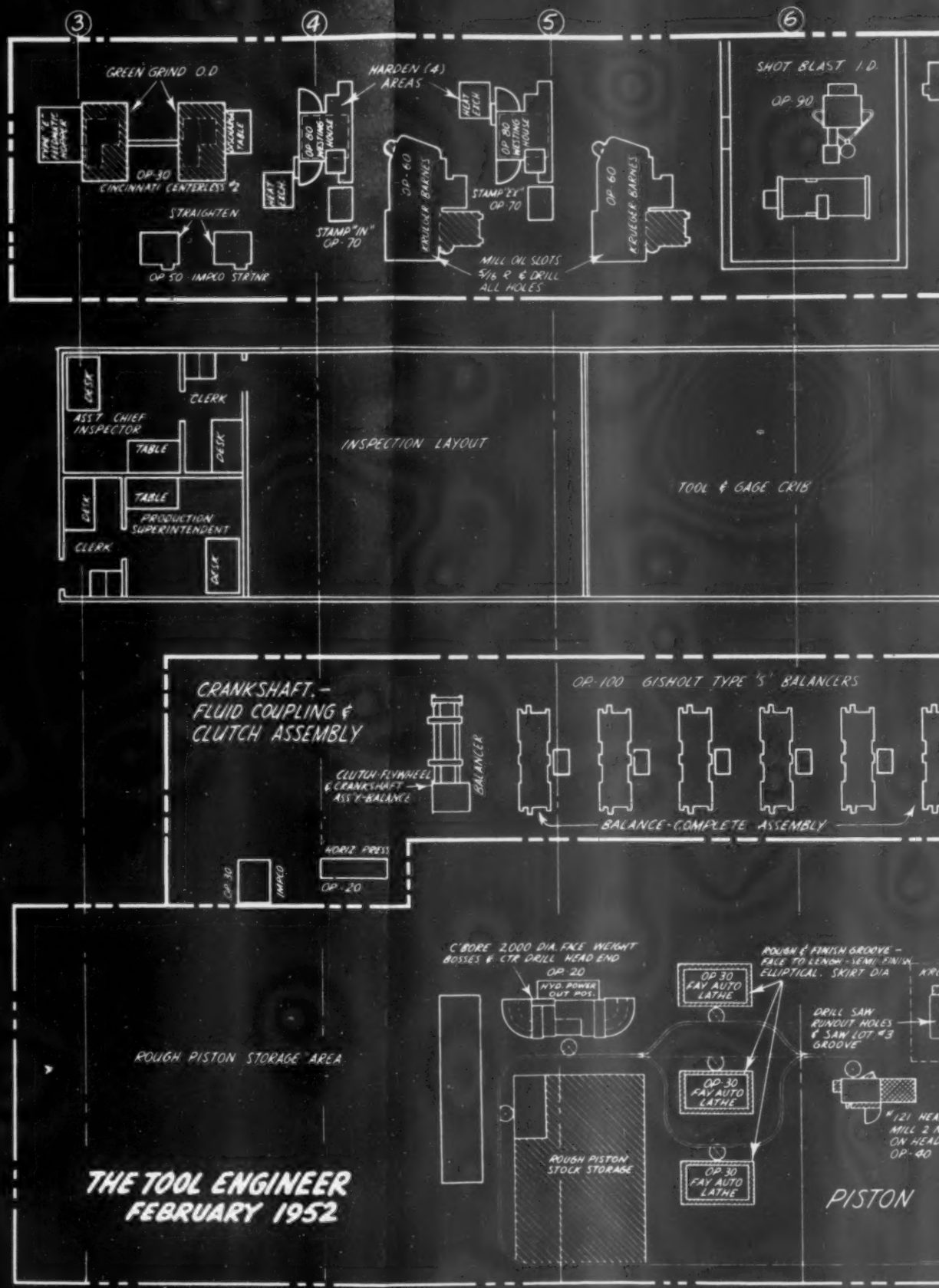
12—Tap seven ⅜-in. *T* holes (exhaust holes)—L. H. head. *L. H. horizontal drill unit.* Rough ream four 0.6875-in. exhaust valve guide holes—R. H. head—to 0.662—0.656-in. *R. H. upper angle drill unit 2 deg from vertical.*

13—Unload

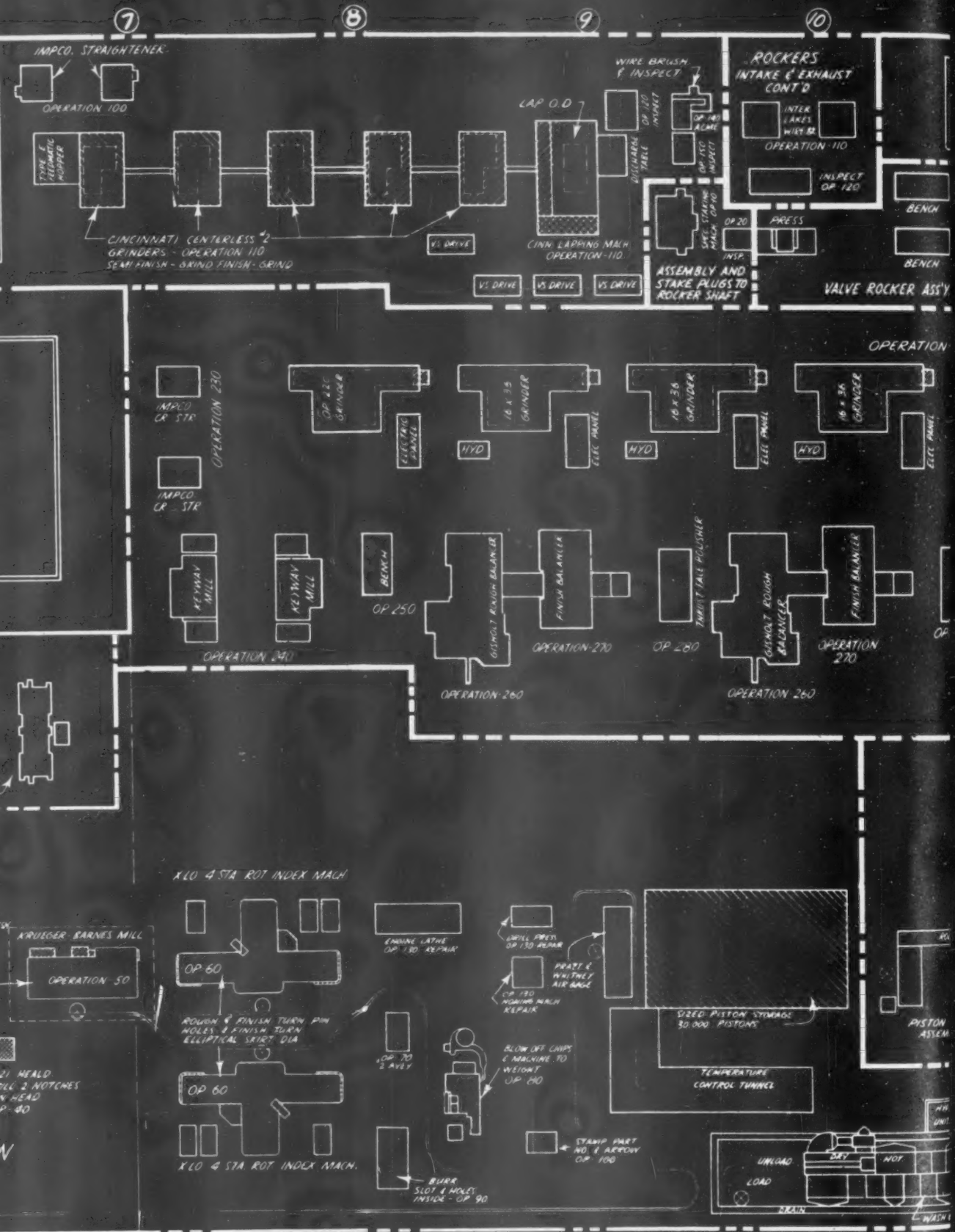
roduction of the crankshaft is e major operation featured in e text and illustrated in this ortion of De Soto's production yout for the new V-8 engine. perations sequences can be fol-wed in conjunction with de-ription in the text; other oper-ions are explained on the rint.


8
9
10
11
12
WIRE BRUSH & INSPECT
LAP O.D
OP. 120 INSPECT
OP. 130 ACME
OP. 150 INSPECT
DISCHARGE TABLE
ROCKERS INTAKE & EXHAUST CONT'D
INTER LAKES WIRE BR
OPERATION - 110
INSPECT OP. 120
LUBRITE
PUMP TANK
HYD. TANK
OPERATION - 170 MILL THD
SUPERFINISH
GISHOLT - OP. 180
INSPECT
OPERATION
V.S. DRIVE
CINN LAPPING MACH OPERATION - 110
V.S. DRIVE
V.S. DRIVE
V.S. DRIVE
SPEC. STAKING MACH. OP. 90
OP. 20
PRESS
INSP.
ASSEMBLY AND STAKE PLUGS TO ROCKER SHAFT
BENCH
INSPECT
BENCH
VALVE ROCKER ASS'Y. COMPLETE
WASHER OP. 190
FILE B
FILE GEAR TOOTH EDGE OP. 200
OP. 210 STRAIGHTEN
OPERATION - 220
OP. 220 GRINDER
ELECTRIC PANEL
16 x 36 GRINDER
HYD
ELEC. PANEL
16 x 36 GRINDER
16 x 36 GRINDER
16 x 36 GRINDER
16 x 36 GRINDER
16 x 36 GRINDER
BENCH
OP. 250
GISHOLT ROUGH BALANCER
FINISH BALANCER
OPERATION - 270
OP. 260
THRUST FACE POLISHER
OPERATION 260
GISHOLT ROUGH BALANCER
FINISH BALANCER
OPERATION 270
OP. 280
THRUST FACE POLISHER
SUPER FINISHER
OPERATION 290
SUPER FINISHER
V.S. DRIVE
AVEY DRILL
OPERATION - 330
CENTER SPRAY WASHER
REPAIR LATHES
OIL BATH
OP. 340
IMPCO
OP. 320
INSPECTION
OP. 310
ENGINE LATHE OP. 130 REPAIR
DRILL PRESS OP. 130 REPAIR
PRATT & WHITNEY AIR GAGE
OP. 130 MORSE MACH. REPAIR
SIZED PISTON STORAGE 30,000 PISTONS
ROLL CONVEYOR
PISTON & CONN. ROD ASSEMBLY AREA
OP. 30
FINISHED CONN. ROD STORAGE 10,000 RODS
OP. 80
BENCH
PIT
WASHER OP. 100
REPAIR STATIONS OPERATION - 140
ASS'Y CONN. ROD
MORSE CONN. ROD OPERATION - 110
ASS'Y CONN ROD
BLOW OFF CHIPS & MACHINE TO WEIGHT OP. 60
OP. 70 & AVEY
STAMP PART NO. & ARROW OP. 100
BURR SLOT & MOLET INSIDE - OP. 90
TEMPERATURE CONTROL THERMEL
HYD UNIT
UNLOAD
LOAD
DRAIN
DRY
WASH
RINSE
MOLYLITE OP. 110
WASH & TIN PLATE


CAMSHAFT
SHAVE GEAR TEETH
OP-160 BTG HARDNESS
REPAIR OP-230
INSPECT
ATION-220
CUT GEAR TEETH
OPERATION-150
LEE'S BRADNER
GEAR HOBBER
5'x30 CAMOMATIC
OP. 130
OP. 120
INSPECT CAM CONTOURS
OPERATION-140
VINCO INSP.
OPERATION-190
STRAIGHTEN & FINISH GRIND ALL CAMS
CRANKSHAFT
16 x 36 GRINDER
ELEC. PANEL
SUNSTRAND LATHE
OPERATION-210
SNYDER 7 STA. TRUNION MACH.
OPERATION-200
HYD.
10"x36 AMS GRINDER
OPERATION-190
CTO 5 A GRINDER
16 x 40 H.I.W. LANDIS GRINDER
VS DRIVE
RELIANCE OP-90
RELIANCE OP-100
LE BLOND 6 AC LATHE
OPERATION-90
OPERATION-100
GISHOLT LATHE
OPERATION 80
OPERATION-70
OPERATION-60 MILW. SIMPLEX MILL
OPERATION-50 MILW. DUPLEX MILL
OPERATION-40 IMPCO CR STR
RELIANCE VS DRIVE
BOREMATIC SINGLE END ASS'Y CONN ROD
FINISH BORE WRIST PIN BUSHING & CRANK END OPERATION-90
OP-80 SPEC M I W MILL
WEIGH UNIT
HYD. UNIT
FINAL BALANCE FINISH BOTH ENDS TO WEIGHT
OP-70 SPEC M I W MILL
PRESS IN BUSHINGS - CHAMF BOTH ENDS
OP-60
BOREMATIC OP-50
ROFF BORE CRANK END & FINISH BORE PIN END
BLANCHARD 16A3 GRINDER OP-40
FINISH GRIND BOTH SIDES CRANK END-ONE SIDE PIN END
PRIMARY BALANCE PIN END TO WEIGHT-HOLLOW MILL
OP-30 - CHAMF (1) SIDE CRANK BORE
OP-20 TRIO
OPERATION-10 BURR JOINT FACE ROD & CAP
STA. #1
STA. 3
STA. 2
OP-90
C SINK BOLT HOLES #2 AVEY OP-100
DRILL-ROU FINISH RU CUT ANGL



THE TOOL ENGINEER
FEBRUARY 1952


7
8
9
10
IMPCO. STRAIGHTENER
OPERATION 100
TYPE 'K' AUTOMATIC HOPPER
CINCINNATI CENTERLESS 2 GRINDERS - OPERATION 110
SEMI FINISH - GRIND FINISH - GRIND
V.S. DRIVE
LAP O.D.
CINN. LAPPING MACH. OPERATION - 110.
DISCHARGE TABLE
WIRE BRUSH & INSPECT
OP. 120 INSPECT
OP. 140 ACME
OP. 150 INSPECT
SKF. STATHIS MACH. OP. 40
ROCKERS INTAKE & EXHAUST CONT'D
INTER LAKES WIRE BR
OPERATION - 110
INSPECT OP. 120
OP. 20
INSP.
PRESS
BENCH
BENCH
ASSEMBLY AND STAKE PLUGS TO ROCKER SHAFT
VALVE ROCKER ASS'Y
OPERATION
IMPCO CR STR
IMPCO CR STR
OPERATION 230
OP. 22C GRINDER
ELECTRIC PANEL
16 x 36 GRINDER
HYD
ELEC PANEL
16 x 36 GRINDER
HYD
ELEC PANEL
16 x 36 GRINDER
HYD
ELEC PANEL
KEYWAY MILL
KEYWAY MILL
BENCH
OP. 250
OPERATION 240
GISHOLT ROUGH BALANCER
FINISH BALANCER
OPERATION - 270
OP. 260
OPERATION 260
TARBOTT TALE POLISHER
GISHOLT ROUGH BALANCER
FINISH BALANCER
OPERATION 270
OPERATION 260
XLO 4 STA. ROT INDEX MACH
KRUEGER BARNES MILL
OPERATION 50
OP. 60
ROUGH & FINISH TURN PIN HOLES & FINISH TURN ELLIPTICAL SEAT DIA
OP. 60
XLO 4 STA. ROT INDEX MACH.
ENGINE LATHE OP. 130 REPAIR
DRILL PRESS OP. 130 REPAIR
PRATT & WHITNEY AIR GAGE
OP. 130 MORTISE MACH. REPAIR
SIZED PISTON STORAGE 30,000 PISTONS
TEMPERATURE CONTROL TUNNEL
PISTON ASSEM
OP. 70 & AVEY
BLOW OFF CHIPS & MACHINE TO WEIGHT OP. 80
STAMP PART NO. & ARROW OP. 100
BURR SLOT & HOLES INSIDE - OP. 90
UNLOAD
LOAD
DRY
HOT
DRAIN
WASH

Intake Manifold

Operation #20—Shot blast passages.

Operation #30—Broach angular joint faces, *Equipment is a Cincinnati special one-way horizontal broach.*

Operation #40—Drill, mill, tap and ream completely. *Equipment is a Snyder special transfer type 22-station machine.*

Station 1—Load 1 part into fixture—water passage to right.

2—L. H. (inverted). Drill eight holes 27/64 in. diam, through. *Equipment—8 spindle heads.* R. H. head (inverted). Drill six holes 27/64 in. diam, through. Completely drill and ream two 27/64 in. (0.421-in. diameter). *Equipment—8 spindle heads.*

3—L. H. head (inverted). Drill, one 23/32 in. diam hole. *Equipment—single spindle head* R. H. head (inverted). Drill one 23/32 in. diam hole. *Equipment—single spindle head.*

4—Vertical finish mill heat control pad, 3-Deg angle. *Equipment—single spindle vertical head.*

5—Vertical finish mill carburetor pad. *Equipment—2 vertical spindles.* Angular finish mill water passage outlet. *Equipment-angular head.*

6—Vacant

7—L. H. Vertical head. Spot face two ¾ in. diam holes. Spot face four ⅞ in. diam holes. *Equipment—6 spindle head.* R. H. Vacant.

8—L. H. Vertical. Tap ½-14 hole. *Equipment—single spindle tapping head.* R. H. Vacant.

9—R. H. Vertical. Spot face two ¾-in. diam holes. Spot face four ⅞-in. diam holes. *Equipment—6-spindle head.* L. H. Vacant.

10—R. H. Vertical head. Tap ½-14 pipe hole. *Equipment single-spindle tapping head.* L. H. Vacant.

11—L. H. Vertical. Drill two ¼-in. diam holes through. Drill two ¼-in. diam holes 13/16 in. deep. Core drill 1-7/16-in. diam hole 3½ in. deep.

12—L. H. Vertical. Drill two ¼-in. diam holes through. Drill two ¼-in. diam holes 13/16 in. deep. Drill two 13/64 in. diam holes 9/16 in. deep. Core drill 1-7/16-in. diam hole 2 in. deep. *Equipment—7-spindle head.*

13—L. H. Vertical head. Countersink two holes 5/16 in. by 90-deg. Countersink four ⅜ in. by 90-deg holes. *Equipment—6-spindle head.*

14—L. H. Vertical. Countersink four ⅜ in. by 90-deg holes. *Equipment—4-spindle head.* R. H. Vacant.

15—L. H. Vertical. Drill two ¼ in. diam holes ⅝ in. deep. Drill one 37/64-in. diam hole through. *Equipment—3-spindle head.*

16—L. H. Vertical. Combi... spot face and counters... two ¼-in. diam hol... *Equipment—2-spind... head.*

17—L. H. Vertical. Drill ... 37/64. diam hole 1⅛ ... deep. Drill two 5/16-... diam hole throug... *Equipment—single-sp... dle heads.*

18—L. H. Vertical. Counte... sink two holes 7/16 ... by 90-deg. *Equipment—... 2-spindle head.*
L. H. Angular. Drill o... 23/64 in. diam hole 1... in. deep. Drill one 23 ... in. diam hole throu... *Equipment—2-spind... head.*

19—Vacant

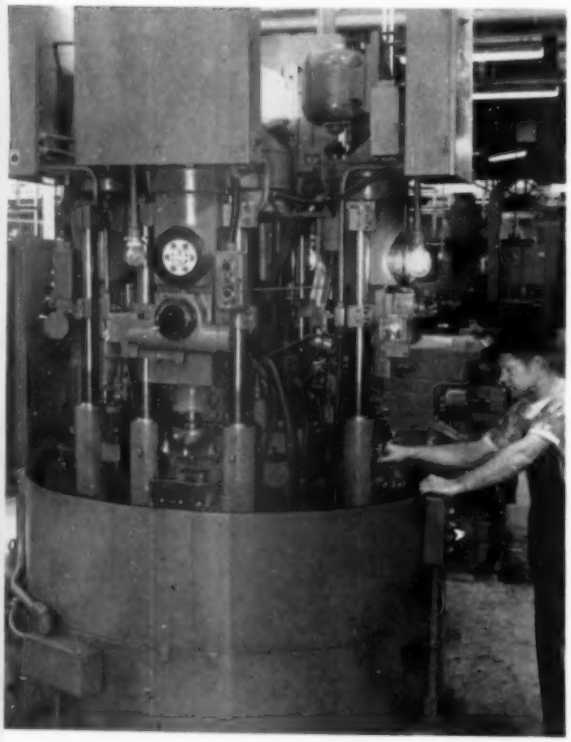
20—R. H. Vertical. Tap tw... ⅜-18 pipe tap ho... Tap two 5/16-18 ho... through. Tap two 5/16-... holes ⅝ deep. *Equip... ment—6-spindle head.*
L. H. Angular. Spot fa... two bosses 2 in. in dia... *Equipment—2-spind... head.*

21—R. H. Vertical. Tap tw... 5/16-18 holes 1½ ... deep. Tap two 5/16-... holes through. Tap tw... 5/16-18 holes ⅝ dee... Tap two ¼-20 holes ⅞ ... deep. *Equipment—... spindle head.*

22—R. H. Angular. Tap tw... ⅜-16 holes throug... *Equipment 2-spindl... head.*
L. H. Angular. Tap on... 7/16-14 hole ⅞ dee... Tap one 7/16-14 ho... through. *Equipment—... spindle head.*

23—Unload

Rocker arm shaft holes are finished on this four-station continuous honing machine.



Chain Case Cover

Operation #20—Mill joint ba... and water pum... base. *Machine i... Newton C-28-C ho... tary mill.*

Operation #30—Broach oil pu... joint face a... seal diameter ... bottom. *Machine ... is a Cincinna... horizontal one-w... hydraulic broa...*

Operation #40—Drill, ream and bore. *Machine is a Greenlee inline transfer type 34-station drilling and milling machine.*

Station 1—Load with contact face toward L. H. head.

2—L. H. head. Combined drill and ream one 0.125-in. diam hole. Combined drill and ream one 13/32-in. diam hole (above holes used for locating). Drill one ¼-in. diam by 1⅝-in. deep hole.
Drill one 13/32-in. diam hole through. *Equipment is head #1 with 14 drill spindles and 4 spindles.*
Drill four 13/32-in. diam holes, half depth. Drill four 5/16-in. diam holes, through. Drill one #31 (0.120-in. diam) hole, ⅜ in. deep. *Equipment is #2 head with 15 drill spindles and 9 spindles.*

3—L. H. head. Drill four 13/32-in. diam holes, ½ depth.
Drill three 13/32-in. diam holes through. Drill one 5/16-in. diam hole, 2 in. deep. Drill two 11/32-in. diam holes, through. *Equipment is head #1 with 14 stub spindles.*
Drill one 15/32-in. diam hole, through. Chamfer four 7/16-in. by 90-deg holes. Drill one #31 (0.120-in. diam) hole, ⅜ in. deep. *Equipment is head #2, with 15 drill spindles and 6 spindles.*

4—Idle

5—L. H. head—Rough bore 2⅜-in. and 3.189-3.191-in. diam holes. *Equipment is head #3 with two stub spindles and one stub spindle.* R. H. head. Rough bore one 4.253-4.257-in. diam hole. *Equipment is head #4 with two stub spindles and one stub spindle.*

6—L. H. head. Finish bore and chamfer one 3.189-0.191-in. diam hole. *Equipment is head #3 with two stub spindles and one stub spindle.* R. H. head. Finish bore and chamfer one 4.253-4.257-in. diam hole. *Equipment is head #4 with two stub spindles and one stub spindle.*

7—Idle

8—L. H. head. Mill ¾-in. wide slot. *Equipment is head #5 with one mill spindle.* R. H. head. Rough bunt face 15 deg angle. Rough bunt face 3½ diam. Chamfer OD and ID. *Equipment is head #6 with one cross facing spindle.*

9—R. H. head. Finish cross face 15 deg angle face. Finish cross face 3½ diam 3rd chamfer 1/32 by 45 deg. Head #6 one cross facing spindle.

10—Idle

11—L. H. head. Combine semi-finish ream two 0.373-0.375-in. diam holes and countersink 7/16 in. by 90 deg. Semi-finish ream one 0.280-0.2815-in. hole.
Drill and tap one hole, ⅜-16 American National tap. *Equipment-head #7 with 8 drill spindles and 4 drill spindles.* R. H. head. Spot face five ⅞-in. diam holes. Spot face two 13/16-in. diam holes. *Equipment is head #8 with 7 drill spindles, 5 tapping spindles and 7 drill spindles.*

12—L. H. head. Finish ream two 0.373-0.375-in. diam holes. Finish ream one 0.280-0.2815-in. diam hole. Countersink one 7/16-in. by 90-deg hole. *Equipment is head #7 with 8 drill spindles and 4 drill spindles.* R. H. head. Tap four ⅜-16 American National tap holes. Tap one ⅜-16 American National tap hole. *Equipment is head #8 with 7 drill spindles, 5 tap spindles and 5 tap spindles.*

13—Idle

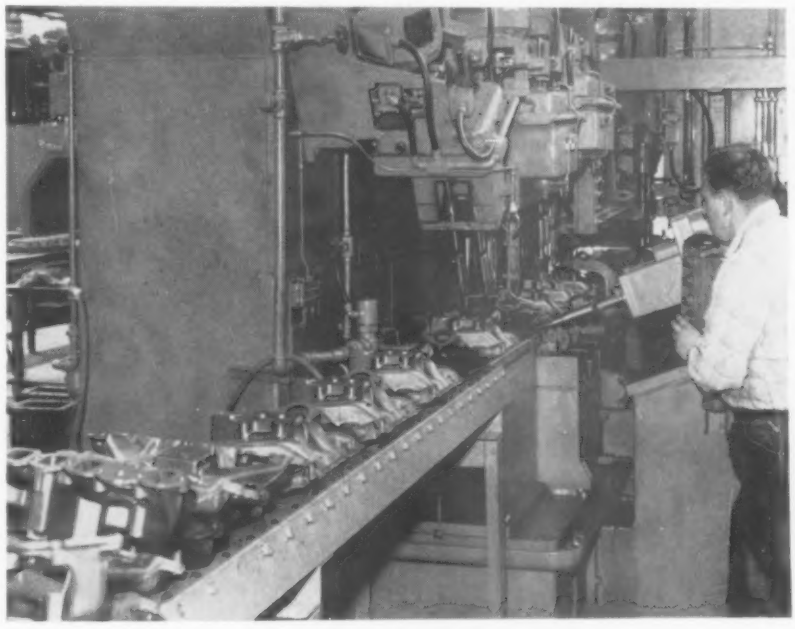
14—Tilt part 90 deg, contact base down.

15—Idle

16—Idle

17—L. H. head. Mill fuel pump pad. *Equipment is head #10 with one mill spindle, one mill spindle.* R. H. head. Mill water passage pad. *Equipment is head #11 with one mill*

Manifolds are being worked by this 22-station transfer machine. Eqipped with 89 tools, the machine drills, mills, taps, and reams cast-iron intake manifolds.



spindle, one mill spindle.

18—Idle

19—L. H. head. Mill both bosses with 8-in. diameter cutter. Mill end nobbing pad with 4½-in. diam cutter. *Equipment is head #9 with two vertical mill spindles, two vertical mill spindles.*

20—Idle

21—L. H. head. Drill two 5/16-in. diam holes for ⅜-16 tap. *Equipment is head #12 with 4 drill spindles, two drill spindles.* R. H. head. Drill two 5/16-in. diam holes for ⅜-16 tap. *Equipment is head #13 with 4 drill spindles, two drill spindles.*

22—L. H. head. Countersink two 7/16-in. by 90-deg holes for ⅜-16 tap. *Equipment is head #12 with 4 drill spindles, two drill spindles.* R. H. head. Countersink two 7/16-in. by 90-deg holes for ⅜-16 tap. *Equipment is head #13 with 4 drill spindles, two drill spindles.*

23—Idle

24—L. H. head. Tap two ⅜-16 American National holes. *Equipment is head #14 horizontal tap, two spindles.* L. H. angular head. Drill 5/16-in. diam hole 1 in. deep. *Equipment is head #15 angular drill with two drill spindles, one drill spindle.* R. H. head. Tap two ⅜-16 American National holes. *Equipment is head #16 with two tap spindles.*

25—L. H. head. Drill one 5/16-in. diam hole, 2-9/16 in. deep. *Equipment is head #15 angular, two drill spindles, one drill spindle.*

26—Idle

27—Rotate part 90 deg.

28—Idle

29—L. H. head. Rough bore one 1.495-1.5005-in. diam hole.
Drill one 9/16-in. diam hole for ⅜-in. pipe tap. *Equipment is head #17 with 3 drill spindles, two drill spindles.* R. H. head. Drill two 0.2570-in. diam holes for 5/16-18 tap. *Equipment is head #*
with 4 drill spindles, tw
drill spindles.

30—L. H. head. Finish bo
one 1.495-1.5005-in. dia
hole. *Equipment is hea*
#17 with two drill spi
dles, one drill spindl
R. H. head. Countersink
two ⅜-in. by 90-deg hole
for 5/16-18 tap. *Equip*
ment is head #18 with
drill spindles, two dri
spindles.

31—Idle

32—L. H. head. Drill 37/6
in. diam hole for ⅜-
pipe tap. *Equipment i*
head #19 with one dri
spindle, two tap spindles
one drill spindle. R. H
head. Tap two 5/16-2
American National holes
Equipment is head #
with two tap spindles.

33—L. H. head. Pipe two ⅜
18 NPSF holes. *Equip*
ment is head #19 wit
two tap spindles, on
drill spindle, two ta
spindles.

34—Unload

The engine block line is fully automatic. Transfer machines such as this perform all the milling, drilling, reaming, boring and tapping of the block.

Crankshaft

Operation #20—Mill locating spo
on cheek Nos. 1
2, 7, and 8. *Equip*
ment is a specia
4-spindle Kearne
& Trecker Milwau
kee Mill.

Operation #30—Rough turn mai
bearings in both
ends. Finish turn
and undercut
with third slide.
Equipment—#1
L.B. LeBlond
double end center
drive lathe.

Operation #40—Straighten within
0.005 in. total in-
dicator reading.
Equipment Impe
straightening ma
chine.

Operation #50—Mill 15/32 in. by
20-deg clearance
slot in flange.
Machine is a
#1248 simplex
type Kearney &
Trecker Milwau
kee Mill.

Operation #60—Mill flats on outer
face of cheeks

TOOL ENGINEERING IN Action

No. 1 and No. 8. *Machine is a #1836 duplex type Kearney & Trecker Milwaukee Mill.*

Operation #70—**Rough grind 5 main bearings in oil seal diameter.** *Machine is a 16 in. x 40 in. type H-1W Multi-wheel hydraulic crankshaft lined bearing grinder.*

Operation #80—**Turn OD and chamfer pin side of counterweight.** *Machine is a Gisholt simplimatic lathe.*

Operation #90—**Rough cheek pin sides of counterweights.** *Machine is a #6 AC LeBlond double spindle automatic crankshaft lathe.*

Operation #100—**Finish cheek and rough turn pin diameter.** *Machine is a #6 AC LeBlond double spindle automatic crankshaft lathe.*

Operation #110—**Finish turn all pin bearings in undercut.** *Machine is a #6 AC LeBlond double spindle automatic crankshaft lathe.*

Operation #120—**Drill all oil holes and two lightening holes in #1 and 4 pins.** *Machine is a Snyder 30-station transfer machine.*

Station 1—Load

2—L. H. Drill oil hole from #2 main to #2 pin, ¼ in. depth. R. H. Drill oil hole from #3 pin to #3 bearing, ¼ in. depth. L. H. Drill oil hole from #2 main to #2 pin ½ in. depth.

3—R. H. Drill oil hole from #3 pin to #3 main, ½ in. depth.

4—L. H. Drill oil hole from #2 main to #2 pin, ¾ in. depth. R. H. Vacant.

5—L. H. Drill oil hole from #2 main to #2 pin, through. R. H. Drill oil hole from #3 pin to #3 main, ¾ in. depth.

6—L. H. Vacant. R. H. Drill oil hole from #3 pin to #3 main, through.

7—L. H. Drill oil hole from #2 pin to #3 main, ¼-in. depth. R. H. Drill oil hole from #4 main to #3 pin, ¼-in. depth.

8—L. H. Drill oil hole from #2 pin to #3 main, ½-in. depth. R. H. Drill oil hole from #4 main to #3 pin, ½-in. depth.

9—L. H. Drill oil hole from #2 pin to #3 main, ¾-in. depth. R. H. Vacant.

10—L. H. Drill oil hole from #2 pin to #3 main, through. R. H. Drill oil hole from #4 main to #3 pin ¾-in. depth.

11—L. H. Vacant. R. H. Drill oil hole from #4 main to #3 pin, through.

12—L. H. Drill oil hole from #1 main to #1 pin, ¼-in. depth. R. H. Drill oil hole from #4 pin to #4 main, ¼-in. depth.

13—L. H. Drill oil hole from #1 main to #1 pin, ½-in. depth. R. H. Drill oil hole from #4 pin to #4 main, ½-in. depth.

14—L. H. Vacant. R. H. Drill oil hole from #4 pin to #4 main, ¾-in. depth.

15—L. H. Drill oil hole from #1 main to #1 pin, ¾-in. depth. R.H. Drill oil hole from #4 pin to #4 main, through.

16—L. H. Drill oil hole from #1 main to #1 pin, through. R. H. Vacant.

17—L. H. Vacant. R. H. Drill oil hole from #5 main to #4 pin, ¼-in. depth. L. H. Drill oil hole from #1 pin to #2 main, ¼-in. depth.

18—R. H. Drill oil hole from #5 main to #4 pin, ½-in. depth.

19—L. H. Drill oil hole from #1 to #2 main, ½-in. depth. R. H. Vacant.

20—L. H. Drill oil hole from #1 pin to #2 main, ¾-in. depth. R. H. Drill oil hole from #5 main to #4 pin, ¾-in. depth.

21—L. H. Drill oil hole from #1 pin to #2 main, through. R. H. Drill oil hole from #5 main to #4 pin, through.

22—L. H. Vacant. R. H. Vacant.

23—L. H. Vacant. R. H. Drill lightening hole in #4 pin, ¼-in. depth.

24—L. H. Vacant. R. H. Drill lightening hole in #4 pin, ½-in. depth.

25—L. H. Drill lightening hole in #1 pin, ¼-in. depth. R. H. Vacant.

26—L. H. Drill lightening hole in #1 pin, ½-in. depth. R. H. Vacant.

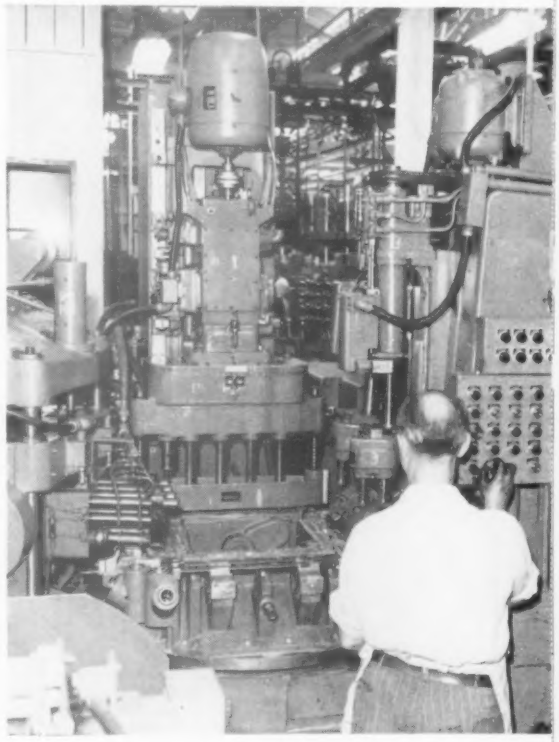
27—L. H. Vacant. R. H. Vacant.

28—L. H. Drill lightening hole in #1 pin, ¾-in. depth. R. H. Drill lightening hole in #4 pin, ¾-in. depth.

29—L. H. Drill lightening hole in #1 pin, through. R. H. Drill lightening hole in #4 pin, through.

30—Blow out all holes.

This Krueger machine on the rocker shaft line drills all oil holes and cuts a slot across each hole for the flow of oil.



Operation #140—Shot peen. *Machine is an American Wheelabrator.*

Operation #150—Straighten within 0.005 in. total indicator reading. *Machine is in Impco straightener.*

Operation #160—Finish grind pressed wall and #3 bearing. *Machine is a Norton 10 x 36, type CTU, semi-automatic grinder.*

Operation #170—Finish grind five main bearings in oil seal diameter. *Machine is a 16 x 40 Landis multi-wheel line bearing grinder.*

Operation #180—Finish grind OD of flange. *Machine is a Norton 10 x 36, type CTU, semi-automatic grinder.*

Operation #190—Finish grind gear pit and full diameter of front face of #1 bearing. *Machine is a Norton 10 x 36 angular rule slide grinder.*

Operation #200—Machine holes in both ends. *Machine is a Snyder 7-station 2-way trunnion machine.*

Station 1—L. H. load and unload. R. H. load and unload.

2—L. H. Drill one 57/64-in. hole ½ in. deep. R. H. Drill one 43/64 in. hole ⅝ in. deep.

3—L. H. Drill one 27/32-in. hole 2⅝ in. deep. R. H. Drill one 43/64-in. hole 1⅝ in. deep.

4—L. H. Counterbore 1-5/16-in. hole 13/32 deep. R. H. Vacant.

5—L. H. Drill one 27/64-in. flange hole through. Drill seven 7/16-in. flange holes, through. R. H. 1 in. center and 13/16 counterbore.

6—L. H. Countersink eight ½-in. diam holes in flange Center one hole, 1⅛-in. diam. R. H. Ream one 11/16-in. hole 1⅝-in. deep.

7—L. H. Ream one 0.4395-0.4425-in. hole. Ream seven 0.4531 holes. Ream one 0.9219 hole. R. H. Tap one ¾-16 hole 1-3/16 in. deep.

Operation #210—Finish turn flange face and bore pilot hole. *Machine is a Sundstrand stub lathe 80 x 36.*

Operation #220—Finish grind all pin bearings and side walls. *Machine is a 16 x 32 type DH Landis semi-automatic pin grinder.*

Operation #230—Straighten within 0.002-in. total indicator reading. *Machine is an Impco straightener.*

Operation #240—Mill woodruff and straight keyway. *Machine is a #44 HV Producto keyway mill.*

Operation #250—Peen all oil holes, file burrs and assemble bobweights to crankshaft.

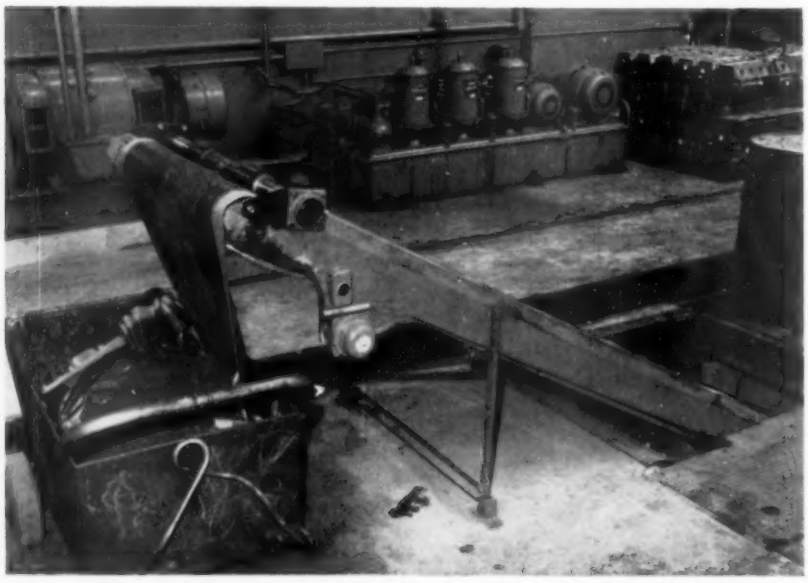
Operation #260—Preliminary balance, rough balance and drill to balance. *Machine is a Gisholt 2-element electrical connected balancing and correction drilling machine.*

Operation #270—Final balance; drill for balance. *Machine is a Gisholt diametric type 3U, balance machine arranged with corrective drilling equipment.*

Operation #280—Remove bobweights, knurl and de-burr oil seal diameter. Polish thrust walls on #3 bearing and wire brush all oil holes. *Machine is an Impco thrust base polisher.*

Operation #290—Superfinish all main pin and oil seal diameters and thrust walls on #3 bearings. *Machine is a Gisholt Model #56 crankshaft Superfinisher.*

The discharge end of the grinding coolant conveyor system is shown here. Coolant is filtered by this continuous paper strip and is recirculated through the grinding line.



American Standard Tolerances for Ball and Roller Bearings

(Continued)

Table 2—ABEC-3 Annular Ball Bearings Except Magneto Bearings. Tolerances in 0.0001 Inch.

Inner Ring

Bore				Tolerance for Bore				Radial Runout (Total Indicator Reading)
Mm		Inches		Average d_m		d min	d max	
Over	Incl	Over	Incl	Low	High			
0	9	0	1/4	−2	+0	−3	+1	2
9	18	3/8	5/8	−2	+0	−3	+1	3
18	30	3/4	1 1/8	−2	+0	−3	+1	3
30	50	1 1/4	1 1/2	−3	+0	−5	+2	4
50	80	...	...	−4	+0	−6	+2	4
80	120	...	...	−5	+0	−8	+3	5
120	180	...	...	−6	+0	−9	+3	6
180	250	...	...	−7	+0	−11	+4	8
250	315	...	...	−8	+0	−12	+4	10

Outer Ring

Outside Diameter				Tolerance for Outside Diameter				Radial Runout (Total Indicator Reading)
Mm		Inches		Average D_m		D max	D min	
Over	Incl	Over	Incl	High	Low			
0	18	0	5/8	+0	−3	+1	−4	4
18	30	3/4	1 1/8	+0	−3	+1	−4	4
30	50	1 3/8	1 7/8	+0	−3	+2	−5	4
50	80	2	2 5/8	+0	−4	+2	−6	5
80	120	...	...	+0	−4	+3	−7	7
120	150	...	...	+0	−5	+3	−8	8
150	180	...	...	+0	−6	+3	−9	9
180	250	...	...	+0	−7	+4	−11	10
250	315	...	...	+0	−8	+4	−12	12
315	400	...	...	+0	−9	+4	−13	14
400	500	...	...	+0	−10	+5	−15	16

Bearings Other Than Duplex
Width of Individual Inner or Outer Ring

Nominal Bore		Inch Type	Width Tolerance	
Mm				
Over	Incl		+	−
0	180	All Sizes	0	50
180	315		0	100
315	400		0	160
400	500		0	180
500	630		0	220

Duplex Bearings*
Total Width of Inner or Outer Rings

Nominal Bore		Inch Type	Width Tolerance	
Mm				
Over	Incl		+	−
0	80	All Sizes	0	200
80	180		0	300
180	315		0	400
315	400		0	500

*If other than a pair of bearings is involved, the tolerance is in proportion to the number of bearings.

American Standard Tolerances for Ball and Roller Bearings

(Continued)

Table 3—ABEC-5, RBEC-5 Annular Ball and Cylindrical Roller Bearings. Except Magneto Bearings. Tolerances in 0.0001 Inch.

Inner Ring

Bore				Bore Tolerance		Radial Runout (Total Indicator Reading)	Parallelism of Sides	Side Runout with Bore	Groove Parallelism with Side (1)
Mm		Inches							
Over	Incl	Over	Incl	*d* min	*d* max				
0	9	0	1/4	−2	+0	2	2	3	3
9	18	3/8	5/8	−2	+0	2	2	3	3
18	30	3/4	1 1/8	−2	+0	2	2	3	3
30	50	1 1/4	1 1/2	−2	+0	2	2	3	3
50	80	...	...	−3	+0	2	2	3	3
80	120	...	...	−3	+0	3	3	3	4
120	180	...	...	−4	+0	3	3	4	4
180	250	...	...	−5	+0	4	4	4	5
250	315	...	...	−5	+0	5	5	5	6

Outer Ring

Outside Diameter				Outside Diameter Tolerance		Radial Runout (Total Indicator Reading)	Parallelism of Sides	Outside Diameter Squareness with side	Groove Parallelism with Side (1)
Mm		Inches							
Over	Incl	Over	Incl	*D* max	*D* min				
0	18	0	5/8	+0	−2	2	2	3	3
18	30	3/4	1 1/8	+0	−2	2	2	3	3
30	50	1 3/8	1 7/8	+0	−2	2	2	3	3
50	80	2	2 5/8	+0	−3	3	2	3	4
80	120	...	...	+0	−3	4	3	3	5
120	150	...	...	+0	−4	4	3	4	5
150	180	...	...	+0	−5	5	3	4	6
180	250	...	...	+0	−5	5	4	4	6
250	315	...	...	+0	−5	6	5	5	7
315	400	...	...	+0	−6	7	5	5	8
400	500	...	...	+0	−7	8	6	6	9

Bearings Other Than Duplex
Width of Individual Inner or Outer Ring

Nominal Bore			Width Tolerance	
Mm		Inch Type		
Over	Incl		+	−
0	180	All Sizes	0	50
180	315		0	100
315	400		0	160
400	500		0	180
500	630		0	220

(1) Applies to groove type ball bearings only.

Duplex Bearings*
Total Width of Inner or Outer Rings

Nominal Bore			Width Tolerance	
Mm		Inch Type		
Over	Incl		+	−
0	80	All Sizes	0	200
80	180		0	300
180	315		0	400
315	400		0	500

*If other than a pair of bearings is involved, the tolerance is in proportion to the number of bearings.

Tooling For Security

International Amphitheatre Sold Out for ASTE Exposition; Keynote Address to be Delivered by Charles E. Wilson

Climaxing the 20th Annual Meeting and the greatest Industrial Exposition in Society history, the keynote address will be presented at the banquet March 20 by Charles E. Wilson, director of the Defense Mobilization Board.

The former president of the General Electric Co. and one of the nation's leading executives brings a rich background of government service and industrial experience to ASTE's "Tooling for Security" Exposition and Annual Meeting.

Office Boy to President

Working his way up from office boy to president, Mr. Wilson had completed over half a century with G-E when he resigned in 1950 to direct the huge and complicated mobilization efforts of the United States.

Although his formal education was halted when he went to work at the age of 12, he learned accounting, math, physics and electrical engineering through correspondence and at night school. In a series of promotions he was made factory accountant, production man, factory superintendent, sales manager and managing engineer.

He was elected a vice president in 1930 and executive vice president in 1937. Two years later the board of directors named Mr. Wilson president of the company.

During World War II he was called to Washington to serve as the head of WPB, with full authority over all war production. Mr. Wilson, on his return to G-E in 1944, was elected to the board of directors and again named president.

In 1946, President Truman named him chairman of the Civil Rights Committee and of the Advisory Committee on Universal Military Training. He is a member of the National Committee for Strengthening Congress.

CHARLES E. WILSON

Largest ASTE Exposition

When Chicago's International Amphitheatre opens its doors on March 17, the most complete exposition ever sponsored by ASTE will come to life for an estimated registration of 25,000 persons.

Sold out just a few weeks after exhibit space was made available, every inch of display room at the Amphitheatre will be used to show the latest in production tools and equipment.

The list of exhibitors stands at 367, the largest representation of manufacturing companies to participate in an ASTE show, reports Executive Secretary Harry E. Conrad. Assignments of space have been completed. Although more than 135,000 square feet was available, a few firms which were late in making application are occupying only the "standing room only" waiting list.

Excellent elevator service will assure easy transportation to the second floor of the Amphitheatre where some 57 percent of the exhibits are located.

One of the most talked about phases of the exposition, Precision Control Hall, is located there in a huge area set aside for exhibits of process control and quality control equipment.

A Permanent Feature

A new feature making its initial appearance at this year's show, Precision Control Hall is slated to become a permanent part of all future expositions staged by the Society.

It provides facilities to manufacturers who need space away from the vibrations and noise of operating exhibits. Exhibits will include instruments, inspection equipment, gaging equipment, measuring equipment, charts and related precision control equipment.

What many have called the "theme exhibit" in the hall is the educational display sponsored by the International Harvester Co.

Occupying a large central area, the exhibit shows how International Harvester saved thousands of dollars in 1951 through quality control. Before and after pictures and case histories have been gathered from each of the company's 17 divisions by the Manufacturing Research Div. which designed and set up the display.

Society Exhibit

A colorful and informative display is planned by the Society. Constructed with an eye to the future, it is made in five collapsible units which can be used separately or together by individual ASTE chapters after the show is over.

All Aboard for the ASTE Exposition Train

Arrangements for a special New York Central train to take eastern and north-central ASTE members to Chicago for the Exposition and Annual Meeting are being handled by National Membership Chairman A. B. Clark.

Mr. Clark reports the following plan will go into effect if response from members and chapters is great enough.

Originating from Grand Central Station at 8 a.m. on Sunday, March 16, the train will make its first stop at Poughkeepsie. The "ASTE Special" will go on to Albany where members coming in from the New England states can make connections.

Other stops will be made at Schenectady, Utica, Syracuse, Rochester, Buffalo, Erie and Toledo. Mr. and Mrs. Clark will act as host and hostess for the trip.

Sleepers will be boarded in Cleveland. Scheduled arrival in Chicago is Monday morning, the opening day of the Exposition.

The train will be made up of coaches, club, diner and observation cars. A special party rate with a savings of up to 28 percent for round-trip tickets from the eastern points to Cleveland will be provided. These tickets will be good only in coaches and may not be stepped up to first class.

Regular fares from Cleveland to Chicago will be in force.

The tickets will enable passengers to make their return trips on any regularly scheduled train within five days after the date of sale.

Write for additional details to A. B. Clark at Haynes Stellite Div., 1517 Superior Ave., Cleveland 14, Ohio. The Hotel New Yorker, where both Mr. and Mrs. Clark will be on hand, has been designated headquarters in New York City on the day before departure. Hotel reservations can be made with the convention manager.

Under a heading of "Tool Engineering, the Art and Science of Mass Production" the display emphasizes the place of tool engineering in design and manufacture by giving a step-by-step progression of product engineering and tool engineering.

More than 400,000 invitations are being mailed out to insure that every executive and tool engineer concerned with production methods and equipment will be invited to attend the exposition.

President J. J. Demuth and other members of the National Exposition Committee, National Director George A. Goodwin and past National Director Fred J. Schmitt, estimate registrations will hit the 25,000 mark or above.

Exposition hours have been set at 9 a.m. to 6 p.m. Registration will close at 5 p.m.

Feature Days

Five "Feature Days" have been designated to relate a particular phase of equipment at the exposition to the technical papers to be delivered. Representatives of the top engineering talent in the country are participating.

More than 40 speakers and panel members will highlight special topics on days devoted to Inspection and

Left: A tugboat pulls a freighter up the Chicago River. Right: The Conrad Hilton Hotel looks out over Grant Park.

Quality Control, Metal Cutting, Materials Forming, Grinding and Finishing, and Machine Accessories, and Drives and Controls.

Other technical subjects will be covered in a lecture series by 24 speakers.

Responsibility for lining up the outstanding program has been shared by Gardner Young, J. O. Horne, Thomas C. Barber, Clinton J. Helton, Kenneth W. Riddle and Frank W. Wilson, ASTE technical director.

Election of Officers

A crowded schedule of business meetings and activities has been planned for Society officers, board members and the House of Delegates.

The Annual Meeting of the Board of Directors is scheduled for March 15. Next year's officers will be elected the following day when the board convenes again.

The House of Delegates will hold their annual caucus March 16 and elect the new board on March 17. All meetings are scheduled for the Conrad Hilton Hotel.

Installation of officers will be an important part of the program for the 20th Annual Banquet on March 20. That noon the Past Presidents' Luncheon will be featured for the men who have led the Society since its founding.

12 Plant Tours

Twelve major manufacturers in the Chicago area will be hosts for ASTE plant tours. Included are:

Aircraft Engine Div.
of Ford Motor Co.
Clearing Machine Co.
Electro Motive Div.
of General Motors Corp.
Kropp Forge Co.
Lindberg Steel Treating Co.
Motorola, Inc.
Scully-Jones and Co.
Thor Corp.
United States Steel Corp.

Recently added to the list is International Harvester Co. Both the Melrose Park Works and the Manufacturing Research Div. will be opened to Society visitors.

Industrial and farm tractors of various types are made at the Melrose Works which also builds engines for the company's other divisions and for more than 100 outside manufacturers. The tour will include the machine and assembly of parts used in various manufacturing operations.

The work at the Manufacturing Research Div. is aimed at improving whenever possible all methods and operations employed in the company's many plants.

Engineers will have opportunity to go through the Hawthorne Works of the Western Electric Co., manufacturer and supplier for the Bell Telephone system. Telephone cable, automatic dial equipment and associated items are made at the plant which employs more than 21,000 persons.

Visitors will see the rod and wire mill, where a 230-pound metal ingot leaves a 1725-degree furnace to become, just 72 seconds later, a 1100-foot coil a quarter of an inch in diameter, and in successive processes is reduced to one or more of 33 wire sizes.

Other tour features will include the cable plant and toolroom.

Milling, boring, drilling and planer operations on a large scale will be the main attraction at Verson Allsteel Press Co.

The new die shop where Verson makes press tooling will be open and those interested in heavy plate operations such as flame cutting, bending, straightening and fabrication of large weldments should find the tour particularly interesting.

Meet at Stockyards Inn

All Feature Day papers will be presented to ASTE audiences meeting at the Stockyards Inn.

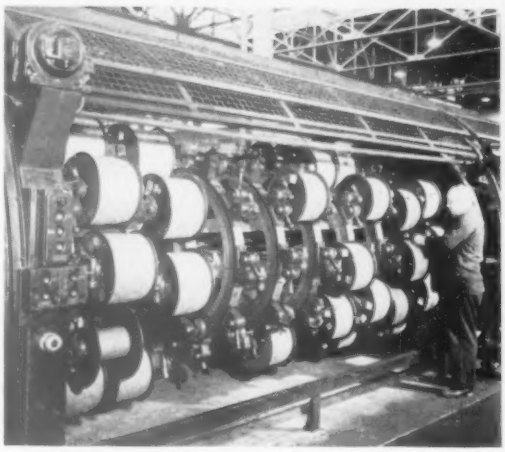
Opening the outstanding series will be Inspection and Quality Control Day. Dr. J. V. Strela, staff statistician, Thompson Products, Inc., will discuss Criteria for Selecting Sampling Methods. Illustrated by nine charts, his paper is based on data from the Thompson sampling machine and describes a stable system of chance causes of variation governing the distribution of dimensional values from a controlled industrial process.

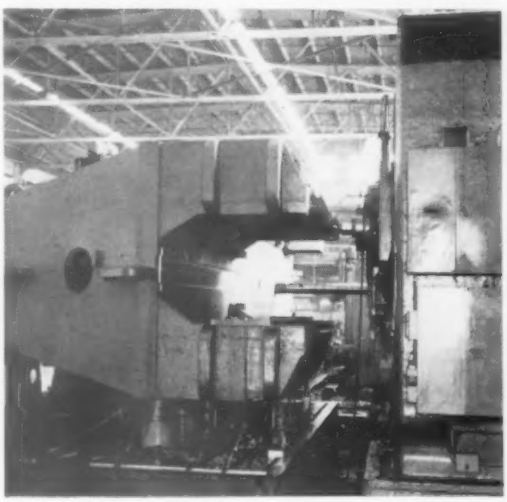
Comparisons between the situations presented and their shop analogies can readily be made, and the experiment may be duplicated for industrial operations.

A lecture on Fixed-Gage Standards and Practice will be delivered by W. H. Gourlie, standards engineer, the Sheffield Corp.

Production-Line Hardness Testing will be covered by the sales manager of Wilson Mechanical Instrument Div., V. E. Lysaght.

A six-man panel discussion, moderated by R. B. Knoth, assistant superintendent, manufacturing engineering,





Cutting large gears at Verson Allsteel Press Co. is pictured in the top photograph. Below it, a portion of the cable winding operation at the Hawthorne Works of Western Electric. The aerial shot shows the Melrose Park Works of the International Harvester Co. The bottom photograph shows finishing milling an 8,000-ton press bed at Verson.

Hotel Accommodations

Applications for hotel rooms during Exposition week are being sent out to all members in a special mailing.

These forms must be completed and sent to the Housing Dept., The Chicago Convention Bureau, Inc., 134 North LaSalle Street, Suite 900, at least 30 days prior to the convention.

If additional blanks are needed for any reason, members should send their requests to ASTE Headquarters.

Particular emphasis is placed on the importance of sending the applications to Chicago at the earliest possible date.

A Chicago landmark, the giant Merchandise Mart houses hundreds of offices and display rooms. Below is a portion of the Windy City's dynamic skyline.

Western Electric Co., Inc., will be held on Turning and Forming Tolerances.

Tuesday, March 18, is designated Metal Cutting Day.

Carl J. Oxford, chief engineer, National Twist Drill & Tool Co., will review Speed and Feed Selections for Efficient Drilling. Proper operating and sharpening techniques, along with a guide to the basic principles for speed and feed selection for drilling, will be presented.

Drilling

Also included in his talk will be an evaluation of drill torque for various conditions of feeds and speeds.

J. I. Karash, process engineer, Reliance Electric & Engineering Co., will give a paper on Drill Jig Design for Secondary Operations.

A discussion on Precision Hole Locating Methods is to be given by F. C. Victory, chief engineer, Moore Special Tool Co.

Moderator of the panel on Drilling will be C. C. Waldo, assistant master mechanic, Electro Motive Div. of General Motors Corp.

On Materials Forming Day, importance of the ability to select the proper heat-treating methods so that the best combination of properties can be developed for a given die design, will be emphasized by C. R. Cory, engineer in charge of die engineering, Fisher Body Div. of General Motors.

He will point out the properties which must be considered—hardness, wear, resistance, machinability, toughness, fatigue limits and edge strength.

A paper on Selection and Treatment of Die Materials will be given by Dr. S. G. Fletcher, chief metallurgist, Latrobe Electric Steel Co.

Moderator for the panel discussion on Metal Stamping Dies and Operations will be S. H. Ericson, chief tool engineer, American Flange & Mfg. Co., Inc.

Grinding and Finish Day on Thursday will include a discussion by W. E. Moody, sales engineer, Bay State Abrasive Products, Inc., on Automatic Size Control in Finish Grinding.

B. H. Work, assistant sales manager, Bonded Products & Grain Div., The Carborundum Co., will speak on Wheels for Precision Production Grinding.

A paper on Finish Grinding Troubles and Remedies will be given by A. W. Todd, assistant chief engineer, Van Norman Co.

A panel on Finish Grinding will be moderated by M. L. Bengtson, vice president, Mercury Engineering Co.

Machine Accessories

The closing day of series will be devoted to Machine Accessories, Drives and Controls.

E. H. Vedder, manager, Industrial Electronics Control Engineering, Westinghouse Corp., will discuss Electronics in Motor Drives.

J. C. Hanna, vice president and chief engineer, Hanna Engineering Works, will give a paper on Principles for Selecting Pneumatic vs. Hydraulic Drives.

H. G. Keller, assistant chief engineer, Link-Belt Co., will cover Variable-Speed and Adjustable-Speed Mechanical Drives.

The panel on Machine Drives and Controls will be led by R. O. Knudson, special machine tool department, Greenlee Bros. & Co.

Joseph Karash Discusses Methods of Reasoning

London, Ont.—Importance of tool engineers being able to give immediate and sound decisions under pressure of economics, time and emotions was stressed by Joseph I. Karash when he addressed members of the London-St. Thomas District chapter in December. He spoke on "A Method of Reasoning for Tool Design."

Author of many articles on tool engineering, Mr. Karash said that a person's ability to make prompt and proper decisions is dependent on his method of reasoning.

Development of this power increases an employee's value to both himself and his employer.

The speaker reviewed the steps in sound reasoning needed in the visualization and designing of machine tools.

Nine new members were welcomed to the chapter. They are: W. F. Graham, F. J. Stevens, William Husolo, J. T. White, G. W. McRae, A. G. Anderson, C. F. Caughell, Kenneth Tood and William Strik.

Movie Shows Work of Plastics Industry

Galt, Ont.—Opportunity to learn the progress made by the plastics industry was given members of the Grand River Valley chapter at their meeting December 7 held at Moffat's Hall.

Research developments, educational work and testing procedures were pictured in a color film on "The Scientific Approach to Better Plastics."

Abrasives and abrasive belt work was covered at the meeting by William Orlick of Alexander and Orlick, Brantford, Ont. His talk, illustrated by slides, covered the many types of wheels, belts and abrasives used in various operations.

Better Safety Records Urged at Elmira Meeting

Elmira, N. Y.—The necessity for better safety records was the theme of a talk presented to Elmira ASTE members by R. A. McVety, safety director of all Remington-Rand plants in the United States.

Mr. McVety emphasized the role played by the tool designer to help companies free themselves of accidents which cost so dearly in life, time and money.

The film "Guardian Angel" was shown in conjunction with the program.

The meeting at the Mark Twain Hotel was attended by 78 members and guests, including Arnold Facious, vice president of foreign manufacturing for Remington-Rand and George Bullen, assistant general manager of the Elmira plant of the firm.

Dale Long (left) presents a scroll announcing the establishment of the Marshall Blu Scholarship Fund to Mr. Blu who also received an honor award from the Society presented by Harry E. Conrad, executive secretary.

Chicago ASTE Chapter Establishes Scholarship Fund in Honor of Marshall Blu

Chicago, Ill.—Chairmanship of the Chicago chapter's show committee for the Industrial Exposition changed hands when Marshall A. Blu resigned from the position because of illness. Chapter Chairman Dale Long accepted the post and turned over his chapter duties to Verne Leopport for the remainder of the term.

Mr. Blu, a charter member of the Society, was honored at the December 11 meeting which commemorated the chapter's 15th anniversary. An honor award for his many years of time devoted to ASTE was presented to Mr. Blu by Harry E. Conrad, ASTE executive secretary. Dale Long announced the establishment of the Marshall Blu Scholarship award to be given by the chapter.

The meeting was held at the Graemere Hotel, site of the first meeting ever held by the Chicago chapter. Included in the large attendance were 11 past chairmen and several charter members.

A buffet dinner, refreshments and community singing made up the social program.

Past Chairman Thomas Barber spoke to the group on the growth of the chapter and the strides since its founding. Robert Cowan, program chairman, introduced Lee DeWald from National Cylinder Co., who talked on the manufacture and use of carbides.

Gives Developments in Automatic Machines

Philadelphia, Pa.—A talk on "Multiple Spindle Automatics" was featured at the November 15th meeting of the Philadelphia chapter. Speaker at the technical session was Robert R. Rhodehamel, general sales manager of the National Acme Co., Cleveland.

Illustrating his discussion with slides, Mr. Rhodehamel traced the early history and developments of automatics up to the present day. He emphasized the economies of modern multiple spindle automatic production. These machines make possible a much greater output and at the same time decrease the unit costs. An informal question period followed.

Coffee speaker at the meeting was Robin Roberts, pitcher with the Philadelphia Phillies.

For those ASTE'rs and guests planning participation in plant tours scheduled for the 20th Annual Meeting, the show committee advises that positive identification of citizenship will be required at most plants.

INDUSTRIAL EXPOSITION

MARCH 17-21 (inclusive)

• • • INTERNATIONAL AMPHITHEATRE • • •

CHICAGO, ILLINOIS

Write for an advance registration form

AMERICAN SOCIETY OF TOOL ENGINEERS

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ASTE members of the Hamilton District chapter set aside their December meeting to honor the past chairmen of the group. A review of progress was given by W. A. Dawson. The evening's program was highlighted by a technical session and a social hour. Past chairmen pictured at the meeting (front row, left to right): J. N. Walton, C. A. Fisher, W. A. Dawson, Joseph Little and Harry Whitehall. Back row: George Churchill, George Gilmour, Gordon Hall, W. A. Alexander and T. G. Fechnay.

17 Keene Engineers Receive Membership Pins

Keene, N.H.—New members of the Keene branch of the Twin States ASTE chapter were presented with membership pins November 28 at a dinner meeting held in the Hotel Ellis. More than 60 engineers and guests were on hand for the second meeting of the co-chapter.

Floyd J. McArthur, Twin States chairman, complimented the Keene engineers on the growth and progress made by their group and made presentations to the following: Charles R. Adams, Charles J. Hanrahan, Frederick W. Hoyt, Jorma L. Kangas, Edward J. Kinsbury, Jr., Arthur H. Knight, Walter S. Parker, Everett F. Patria, David A. Piper, Earl S. Stanley, Robert B. Vaughan, all of Kingsbury Machine Tool Co.

Other members are Chester A. Werme, Kenneth D. Ringland and Philip H. McKinstry, of Central Screw Co. and Donald Fuller, James Brown, William Morgan of Markem Machine Co.

Featured speaker Dr. Leo P. Tarasov, metallurgical engineer at the Norton Co. research laboratory, reported on a series of tests made by the laboratory to eliminate many of the problems connected with the grinding of tool steels.

He pointed out that proper preparatino and care of metal to be ground, rather than the grinding substances, are the key to better, more economical and efficient production.

Edward Ellingwood, executive vice president of the Keene Regional Industrial Foundation, outlined the aims and purposes of his organization in promoting industrial development of the area.

James N. McHoul is acting chairman of the Keene co-chapter.

Lengbridge Speaks on Aluminum Presswork

Peterboro, Ont. — ASTE members from the Peterboro area heard John W. Lengbridge in a talk on aluminum presswork at the chapter's first technical session since receiving its charter.

The well-known project engineer of Aluminum Goods, Ltd., Toronto, emphasized the importance of the tool designer involved in the work of metal forming having a thorough knowledge of metal flow so he can best plan the operations required to process an article.

Such knowledge helps him to estimate tooling costs and to foresee possible problems while the article is still on the design board, rather than after tools are constructed and in the presses.

More than 65 members and their guests attended the technical session.

Past Chairmen Honored by Hamilton Members

Brantford, Ont.—All of the men who have served as chairmen of the Hamilton District chapter were on hand December 14 for Past Chairmen's Night held at the Brantford Hotel. The dinner meeting was attended by more than 75 members and friends.

W. A. Dawson reviewed the progress of the chapter since the charter night in 1941, highlighting the expansion of the Hamilton group and subsequent establishment of the Niagara, Grand River Valley and London chapters.

Technical speaker was F. F. Bain of Atlas Steel. He explained the processes used in making stainless steel, the rolling of the hot billet to procedures on hot and cold forming, machining and grinding.

A social hour was conducted by Charles Kemp and Sydney Dunn.

J. N. Wood, Karl Nowak Receive Promotions

Two members of the Boston ASTE chapter were recently promoted to new positions at Fenwal, Inc., Ashland, Mass.

J. Norton Wood was appointed engineer in charge of production engineering. He has been with Fenwal since 1946 and has held positions as chief tool designer and chief methods engineer.

Karl G. Nowak, ASTE chapter treasurer, was named chief methods engineer. In his new capacity, Mr. Nowak is responsible for all phases of manufacturing procedures, processes and equipment.

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President J. J. Demuth (bow tie) talks with J. A. Scully, president of Scully-Jones and Co., and Harry Conn, chief engineer, at the December meeting of the Cedar Rapids chapter held at the Hotel Montrose.

Reviews History of Societe Genevoise

Montreal, Que.—Technical speaker at the December meeting of the Montreal ASTE chapter was J. B. Riley, general sales manager of the American SIP Corp. and North American representative for the Societe Genevoise, Geneva, Switzerland. More than 150 members and guests attended the meeting held at the Canadian Legion Memorial Building.

Mr. Riley traced the history of Societe Genevoise from its founding in 1858 by a few professors at the University of Geneva, through 1875 when SIP supplied a number of standard scales to bureaus of standards throughout the world, to the present production of precision equipment. The latter includes jig borers, leadscrew machines, optical machines, thread grinders, dividing machines, universal measuring machines, profile projectors and many small measuring instruments.

A film on "Manufacturing with Precision" illustrated the design and precise manufacturing techniques employed in the production of SIP machines. It also pictured the machines in operation in customers' plants throughout the country.

Buffet refreshments were served after the meeting.

Society Announces 1952 Scholarship Plans

Professional interests, work experience, recommendations of faculty members and academic standings will be some of the determining factors in selecting the winners of the Society's 1952 scholarships.

Of the five awards of $300 each, four will go to students in the United States and one will be presented to a Canadian student. Applicants must be in their fourth or fifth year and taking college level subjects under the general category of tool engineering.

The deadline for applicants has been set at March 1, 1952. Final selection will be made by the ASTE National Education Committee.

Named Chief Engineer

Kenneth E. Ferguson of the Cedar Rapids chapter has taken over his new duties as chief industrial engineer for the Kiowa Corp. in Marshalltown, Iowa. He was formerly a time study analyst with Link-Belt Speeder Corp., Cedar Rapids.

His ASTE treasurer's post is being filled by Frank J. Jekerle.

Ohio State Student Wins Columbus Award

Columbus, Ohio—Thomas A. LaValle, a student in the industrial engineering department at Ohio State University, received the annual scholarship award of $300 provided by the Columbus ASTE chapter.

Mr. LaValle completed the requirements for his Bachelor of Science Degree last December and is working for his Master's Degree in production and tool engineering under Prof. Jay N. Edmondson, chairman of the National Education Committee.

Work of Every Member Needed for Expansion

Cedar Rapids, Iowa—ASTE progress and the current activities of the Society provided the theme for the address of President J. J. Demuth before the Cedar Rapids chapter. Nearly 75 members and guests attended the meeting held December 5 at the Hotel Montrose.

Mr. Demuth discussed the fulfillment of the goals of ASTE, emphasizing the need for each member to work for continued growth of his chapter.

Harry Conn, chief engineer at Scully-Jones and Co., Chicago, spoke on tapping problems during the technical session. Slides and samples of the company's products illustrated his talk.

One of the honored guests at the meeting was J. A. Scully, president of the Chicago firm.

Gives Military View on Peace in Korea

Poughkeepsie, N. Y.—"Peace in Korea should not cause relaxation of our defense efforts," Lt. Col. E. A. Rew told 60 members and guests of the Mid-Hudson chapter at the December meeting.

Discussing a military slant on current news, Col. Rew explained that a truce in Korea will indicate that the Russians have decided to move the bulk of their military activities to some other part of the world.

James D. Roberson, vice president and sales manager of Instrument Specialties Co., Inc., Little Falls, New Jersey, spoke on methods and techniques in the fabrication of beryllium copper springs.

He was assisted by F. S. Stickney, who prepared the many color slides used to show the tools and beryllium copper spring made by Instrument Specialties.

A crowd of 134 Indianapolis members and their guests enjoyed the annual Ladies' Night held on December 6. A dinner and a program of dancing and entertainment was held at the Athenaeum. Pictured in the front row (from the left): Mrs. George Duncan, Mrs. E. W. Hilkenbach, Mrs. Joseph Penn, Mrs. J. P. Enright and Mrs. Denis White. Back row: Second Vice Chairman Duncan, Chairman Hilkenbach, Secretary Joseph Penn, Treasurer J. P. Enright and First Vice Chairman White.

West Coast News

By Andrew E. Rylander

Well, I'm getting around and broadening a circle of acquaintances among western tool engineers. Incidentally, I have become more accessible as a result of finally getting a telephone. The number is Walnut Creek 8052 in case any ASTE member has occasion to contact me in a hurry.

Considerable interest is being evinced here in the coming ASTE Industrial Exposition in Chicago. A good number of West Coast manufacturers are exhibiting at this outstanding tool show. All roads lead to Chicago, March 17 to 21.

Visits Nordstrom

Had the pleasure of visiting Nordstrom Valve Div. of the Rockwell Mfg. Co. in Oakland. Spent a pleasant couple of hours chatting with Floyd Snodgrass who, like so many prominent tool engineers, has come up through the school of practical experience. A native of Washington state, he served his apprenticeship as machinist in San Francisco while taking evening courses in drafting, math and engineering.

Joining the Nordstrom organization in 1936 as a machinist, he was in turn stepped up to cutting tool engineer, coordinator and to shop superintendent during the reorganization of the plant in 1944. Eight months later he was made works manager, then assistant general manager and in January, 1949, was promoted to general manager. That's stepping along!

An active supporter of ASTE, he served as chairman of the Golden Gate chapter in 1947. Among other activities, he is a director of the Oakland Chamber of Commerce and president of the California Metal Trades Assoc. The last group represents the metal working industries in labor relations for the Bay Area. An exponent of apprentice training, he was chairman of the Alameda-Contra Costa Counties' Joint Apprenticeship Committee for the machinist trades in 1948-49.

Asked for his opinion on industrial conditions on the West Coast, Floyd said the pressing need is for skilled craftsmen. While apprenticeship courses are strongly encouraged by both management and labor, it seems that the armed forces take the boys from the plants as soon as graduated and even while learning. As a result, the local industrial front suffers from lack of trained replacements.

With Ted Rohrer of Pratt & Whitney's San Francisco branch and Dick Constantine of the Remler Co., I enjoyed a most interesting visit at the Friden Calculating Machine Co. in San Leandro. It is among the most efficiently operated companies I have been privileged to visit.

We were shown "the works" by Fred Urquhart, tool room superintendent, who combines that function with inventing newer and better ways of making things. Among other innovations he has had made up a rotary gear cutter, about 32 pitch with brazed-on carbide teeth, which is a definite accomplishment in view of the comparatively fine pitch. The final shaping of the involute form and the back-off was done by crush grinding, using Sheffield crusher rolls. Application was also rather novel, two cutters operating on opposite sides of the blank to cut manufacturing time in half.

Tool room equipment is superb and plant layout modern as tomorrow. The press room indicated tool engineering on a high order. In many instances intricate shapes are formed in the one draw without any traceable evidence of wrinkling. Among other things, they have some interesting applications of press broaching.

In Father's Footsteps

During the rounds, had the pleasure of meeting Harold L. Burlingame, head of the Friden screw machine department. Harold is the son of the late Luther Burlingame of Brown & Sharpe Mfg. Co. and served his apprenticeship at B & S. Needless to say, with such background Harold knows his screw machines.

Intricate parts, many of them with several stepped diameters, are consistently held to plus or minus 0.0005 inch tolerances during day-in and day-out runs. Other parts even more intricate have one or several milling operations performed, in addition to turning, in the one cycle on Brown & Sharpe automatics. For that matter, quality control on a high order predominated throughout the plant.

I visited the Hummel Furniture Co. in Berkley where Al Baumgartner is production manager. For many years he was superintendent of Detroit Molding and later superintendent of Pyramid Molding Co. in Chicago at which time he contributed an article on forming rolls for THE TOOL ENGINEER. Al finds the transition from metals to wood and fabrics one of those "naturals" that a tool engineer takes in his stride. To Al goes a most cordial invitation to apply for ASTE membership.

"Modern Machine Tools" was discussed by Sailor Beer (left) of the Monarch Machine Tool Co. at the Los Alamos meeting held December 6. Chairman Joseph A. Parks (right) conducted the meeting which was attended by 135 persons.

L. E. Osborne Appointed Executive Vice President

L. E. Osborne, formerly vice president in charge of manufacturing at Westinghouse Electric Corp., has been named to the newly created post of executive vice president in charge of defense products.

Mr. Osborne has been assigned responsibility and authority for all defense efforts of the company. He is a member of the Philadelphia chapter.

Annual Ladies' Night Held in Worcester

Worcester, Mass.—A record-breaking attendance of 170 persons was on hand for the annual Ladies' Night held December 4 by the Worcester chapter.

Dinner was served at Putnam at Thurston's where the program was devoted to entertainment and dancing. Guests at the informal gathering received gifts from the chapter.

In charge of the arrangements were Chairman Ralph Baker and Maurice Terrill, entertainment chairman.

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INDUSTRIAL EXPOSITION

MARCH 17-21 (inclusive)

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EXECUTIVE ENGINEER—Age, 41, desires change of employment. Diversified experience in engineering and manufacturing of refrigerators, freezers, washers, ironers and other appliances.

Detailed in production engineering, production control, plant engineering, product design and development, factory cost, purchasing, personnel and sales engineering.

Former positions include works manager, chief engineer and chief production engineer. Present salary is in five figures. Write Box 201, THE TOOL ENGINEER, 10700 Puritan Ave., Detroit 21, Mich., for further details.

Parties Substitute for Technical Sessions

Technical programs took a back seat to holiday festivities at many of the ASTE meetings held in December.

Cleveland combined sociability with its scholarship fund dance on December 15 at its annual party held in the Rainbow Room of the Hotel Carter. More than 600 tool engineers, their wives and guests enjoyed dinner and dancing and entertainment provided by Jerry Bogner and his committee. Sponsors contributed $1,250 to the scholarship fund.

A large crowd of 406 members and guests of the Saginaw Valley chapter in Michigan attended the annual Ladies' Night and Christmas party held December 1. The program of dinner, dancing and entertainment was held at Zehnders' Hotel in Frankenmuth.

At Muncie, Ind., ASTE members held their sixth annual Ladies' Night and holiday party on December 8 at the Top Hat. Barton Reese Pogue, known as the Hoosier Humorist, was guest speaker. Music for dancing was provided by the Betty Petty Trio.

More than 400 members and guests of the Philadelphia chapter were on hand December 20 for the Christmas party held in the ballroom of the Broadwood Hotel.

Entertainment Chairman Richard Miller and Chapter Chairman Larry McAfee handled the program for Dayton members on December 8. The party at the Miami Valley Country Club included dinner and dancing for more than 160 persons.

Engineering Dean Speaks at Peoria Meeting

Peoria, Ill.—Dr. William L. Everitt, dean of the college of engineering and director of the engineering experiment station at the University of Illinois, spoke at the December meeting of the Peoria chapter.

More than 150 members and guests heard his informative lecture on current problems encountered in the perfecting of color television.

Columbus Television Series to Feature Program on ASTE and Tool Engineering

ASTE will make its first television appearance February 10 when the Columbus (Ohio) Technical Council pictures the activities of the Society and the tool engineering field on the "Engineering Your Life" series. The program will be presented at 12 noon, EST, over Channel 10 as a public service of station WBNS-TV in Columbus.

Television viewers will have opportunity to see for themselves the meaning of "Behind Every Manufactured Product is the Tool Engineer." They will learn the steps necessary in manufacturing an item familiar to everyone —the coffee pot. A forum discussion will indicate the decisions and considerations that must be made before production can begin. Actual plant operation involving tool engineers will be shown on film.

A collection of 'help wanted' newspaper advertisements will illustrate the current shortage of tool engineers. Jay N. Edmondson, National Education Chairman, will give the reasons such shortages exist and tell how they can be corrected through expansion of present education facilities.

Other ASTE members participating in the program are S. A. Matchett, past chairman, and Jack E. Mitchell, first vice chairman. Chairman Milner D. Sherman, Secretary Marlin Schueler, Second Vice Chairman Charles R. Youmans, and Treasurer E. A. Bartlow are serving on the planning committee.

Each week the Technical Council devotes a program to the work of one of its 22 affiliated engineering organizations. Producer of the series is Richard Bell, former director of an educational series for Ohio State University, who is currently working on a Ph.D. degree in radio education.

Foundry Practice Vital to Design Engineering

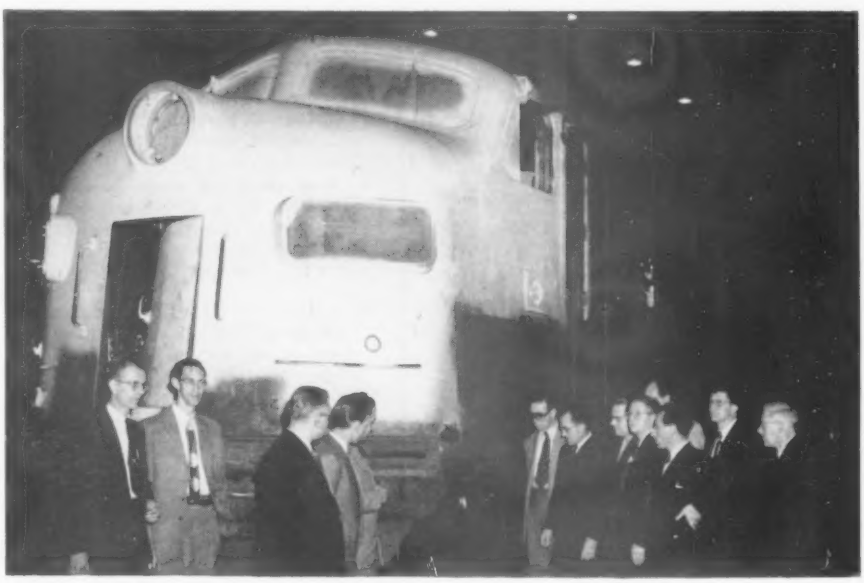
Windsor, Vt.—From raw materials to the finished product, the complete story of making steel castings at the Lebanon Steel Foundry was dramatically pictured in a color film shown December 12 to nearly 100 members of the Twin States chapter.

Principal speaker on the program was A. P. Gagnon, sales manager of the Builders' Iron Foundry. Providence, R. I., who discussed "Foundry Practice and the Design Engineer."

Drawing on a background of 15 years of machine shop experience as machinist foreman, shop superintendent and tool methods engineer, Mr. Gagnon covered the problems encountered in designing and machining castings. He was assisted during the question and answer period by Ahti A. Erkkinen, foundry superintendent at the Providence firm.

A dinner served at the Windsor House preceded the main part of the technical session.

A partially assembled diesel locomotive is viewed by members of the London-St. Thomas chapter on a tour of the General Motors Diesel plant in London. Left to right are: Charles Virgison, Joseph Jones, Armond Favaloro, Roy Conn, Walter Knoepflie, William Strick, Homer Kilbourn, Frank Galloway, Roy Hind, Roy Brown (guide), Stan Lindsay, Harold Noland and Wilf McKee. Speaker at the November meeting was T. W. Pizel, educational director of the General Motors Corp.



E. L. Hosse (center), "the Hoosier Humorist," was the coffee speaker at the Evansville chapter meeting on December 10. After dinner members adjourned for a tour at Igleheart Bros. Milling Co., makers of Swansdown flour and cake mix. Left, Chapter Secretary Bernard Pampe; right, Entertainment Chairman Joseph W. Halbig.

Wichita Members Hear Melvin D. Verson

Wichita, Kan.—An audience of 82 members and guests of the Wichita ASTE chapter heard Melvin D. Verson, assistant sales manager of the Verson Allsteel Press Co., speak December 12 on "Automatic Transfer Press Working."

Color films were shown of high production work with heavy presses in plants utilizing the conveyor system. Use of progressive dies was stressed by the speaker who showed the way to achieve fast production and still employ modern safety precautions.

A highlight of the meeting was the circulation of the chapter's current yearbook. The pocket-size booklet lists a double roster of Wichita's 185 ASTE members, alphabetically and by company affiliation. National and local officers, committee chairmen and plant representatives are designated. The tool engineers' pledge and membership qualifications are also included.

James H. Janson and Roy O. White received special mention for their work in putting out the publication.

Research Director Discusses Titanium

New York, N. Y.—An all-inclusive discussion on titanium was given before the Greater New York chapter December 3 at a meeting held at the Hotel New Yorker. The speaker was S. A. Herres of the Allegheny Ludlum Steel Corp.

The director of titanium research at the Watervliet Plant of the corporation, Mr. Herres covered the availability of titanium ores, production of titanium metal, melting and fabrication.

He also explained properties of pure titanium and base alloys as well as present and potential applications.

Eliminate Weight With Die Castings

Racine, Wis.—"Die Casting and Finishing" was presented in lecture and film at the Racine meeting on December 3 by R. P. Dunn, metallurgist with the Doehler-Jarvis Corp.

Mr. Dunn pointed out that with die castings, a great deal of weight can be eliminated without sacrificing rigidity of part pieces if struts or reinforcements are used.

The movie pictured all of the operations necessary in turning out die castings.

Detroit Chapter Offers Two Scholarship Awards

Detroit, Mich.—Two scholarships of up to $450 each will be awarded this spring as part of the education program of the Detroit ASTE chapter.

Applications are now being accepted from young men who are graduating from high schools in the metropolitan Detroit area or enrolled in engineering courses at Michigan colleges.

A complete educational and personal history is being asked of all applicants, including character references, transcript of grades, results from the mechanical aptitude test, outline of outside activities and a recent four by five inch photograph.

Young men who are residents of metropolitan Detroit, have a 2.75 grade average or better in high school (a 3 average in college), and who plan to make tool engineering a life's work are eligible.

The awards will be made to scholarship winners in June.

Letters of application or inquiry are being handled by M. O. Cox, chairman of the scholarship committee.

Membership Leaders

Three more chapters of the Society have joined the leaders in the membership campaign. Records of at least 2 percent increases in membership have been made by chapters in Jackson, Mich., Long Island, N. Y., and Peoria, Ill.

POSITIONS AVAILABLE

TOOL AND MACHINE DESIGNERS—One of Cincinnati's largest permanent design firms has openings in their own office for experienced machine, product and tool designers, and detailers.

Recent engineering graduates or students will also be given consideration. These are permanent positions with a substantial, stable leader in the field. We can offer top starting wages, modern working conditions, paid holidays, vacations, and other benefits. Our policies assure varied experience and unusual opportunities with a future.

New employees would be expected to settle on a permanent basis in Cincinnati. Please send resume to Cincinnati Designing, Inc., 37 W. Seventh St., Cincinnati 2, Ohio.

PRODUCT DESIGN ENGINEERS AND DRAFTSMEN—Large cutting tool manufacturer located on East Coast offers opportunities in long range design and development program.

Permanent positions, employee benefits and training program offered.

Basic experience in tool design desirable. Write fully or apply in person to personnel department, Morse Twist Drill & Machine Co., New Bedford, Mass.

DESIGN ENGINEER—Are you ready to settle down? Permanent position open in small engineering department, must be experienced in designing and making deep draw dies. Write or call Carter at Geneva Metal Wheel, Geneva, Ohio.

DESIGN ENGINEERS—The Taylor-Winfield Corp., 1052 Mahoning Avenue, N. W., Warren, Ohio, a leading electric resistance welder and electronic control manufacturer, has five openings for design engineers in its mechanical engineering department. These are permanent positions, provided men selected prove they have the necessary skill and ability. Men with resistance welding design experience are preferred. However, recent mechanical engineering graduates will be given careful consideration.

The work is 100 percent board work, involving the design of electric resistance welder machines and component parts, such as jigs and fixtures used in conjunction with this type of equipment. Experience or training in electro-mechanical machinery would be a definite asset in meeting job requirements.

Interested applicants should write the personnel department. State age, education, experience, salary expected and other pertinent data.

Technical speaker at the Rochester meeting in December was J. S. Gillespie (left), product sales manager of the Carboloy Dept. of General Electric Co. He spoke on applications of carbides. Chapter Chairman James O. Horne officiated at the meeting.

Obituaries

John L. Stephenson

John L. Stephenson, a member of the ASTE chapter in Columbus, Ohio, died September 2 after a long illness. Until his leave of absence from Ranco, Inc., a year ago, Mr. Stephenson was in charge of all die work for the firm.

He was born December 9, 1897 in Logan County, Ohio and went to Columbus when he was 16 years old to start his tool apprenticeship at the Columbus Bolt Works. He later worked at the Modern Die Tool Co. and joined Ranco in 1930.

Arthur E. Becker, Sr.

Arthur E. Becker, Sr., layout man in the instrument section of Sandia Corp., Albuquerque, N. M., died December 14 at the age of 53. He was a charter senior member of the Albuquerque chapter of the Society.

Mr. Becker had been with the Sandia Corp. for the past five years and was formerly employed by the Fearless Camera Corp., Culver City, Calif. He taught machine shop practices for two years at the Albuquerque High School and at one time managed his own garage and machine shop in Albuquerque.

Harry C. Goodwill

Harry C. Goodwill, 63, owner of the Goodwill Tool and Supply Co. in Poughkeepsie, N. Y., died November 3 after a short illness. He was a member of the Mid-Hudson ASTE chapter.

Born in Wallingford, Conn., Mr. Goodwill was associated with IBM and the Pratt and Whitney Co. before heading his own firm.

He was a charter member of the New Haven chapter of the American Society for Metals, a member of Compass Lodge, Free and Accepted Masons in Wallingford and a member of the Loyal Order of Moose of Wallingford.

Coming MEETINGS

CHICAGO—March 17-21, American Society of Tool Engineers' Industrial Exposition and 20th Annual Meeting.

BOSTON—February 14. Speaker: G. B. Parsons, consulting plastics engineer. Subject: "Substituting Plastics for Metals."

CLEVELAND—February 8. Election of officers. A national representative of ASTE will speak on "Impact of the Tool Engineer on Modern Economy." March 3. Installation of officers at a joint meeting with the Cleveland ASM chapter at the Tudor Arms Hotel. Speaker: W. H. Oldacre, president, D. A. Stuart Oil Co., Chicago. Subject: "Machinability of Metals as Affected by Cutting Fluids."

DETROIT—February 14. Program on purchase engineering. Carbide Section: February 7, "Milling." March 6, "Drilling and Reaming." Student Section: February 21, "Quick Acting, Automatic Fixture Design."

ERIE—March 4. Speaker: N. C. Taylor, Tennessee Eastman Co., Cleveland. Subject: "Plastics and Tooling."

GRAND RIVER VALLEY—February 1. Speaker: H. L. Murch, chief optical engineer, Jones and Lamson Machine Co., Springfield, Vt. March 7. A representative of the Progress Welder Co., Detroit, will speak on "Designing for Resistance Welding."

GRANITE CITY—February 12. Speaker: Ralph S. Battles, Judson L. Thomson Mfg. Co., Waltham, Mass. Subject: "Rivets and Auto-riveting Methods and Applications."

HAMILTON DISTRICT—February 8, Brantford Hotel, Members' Night.

GREATER LANCASTER—February 19, Stevens Trade School. Speaker: W. W. Schug, V & O Press Co., Hudson, N.Y. Subject: "Small Presses Geared for High Production."

GREATER NEW YORK—February 4. Speaker: G. R. Brown, field metallurgist, Haynes Stellite Co. New York City. Subject: "Precision Investment and Casting Process."

LEHIGH VALLEY—February 15. Speaker: Clarence H. Adams, chief executive engineer, Cone Automatic Machine Co., Windsor, Vt., and Gerard Machine Co., New York City, Subject: "Latest Developments in Automatic Screw Machines."

LITTLE RHODY—February 7, Brown & Sharpe Night. Subject: "Screw Machines."

MADISON—February 11. Speaker: J. J. Jaeger, Pratt & Whitney, West Hartford, Conn. Subject: "Jig Boring and Related Problems."

MUNICE—February 5. A representative of Federal Products Corp., Providence, R.I., will discuss "Gaging for Profit." March 4. Speaker: Harry Conn, chief engineer, Scully-Jones & Co., Chicago. Subject: "Production Tooling Problems."

NEW HAVEN—February 14. A program on "Tooling for Multiple Slide Presses" will be presented by a representative of the U. S. Tool Co.

PHILADELPHIA—February 21. Speaker: E. Schoemmel, Osborne Mfg. Co. Cleveland. Subject: "Brushes in Modern Industry."

SEATTLE—February 26, tour through Weyerhaeuser Lumber Co., Everett.

SCHENECTADY—February 14. Speaker: Glen H. Stimson, Greenfield Tap and Die Corp., Greenfield, Mass. Subject: "Development of the Unified Screw Threads."

TULSA—February 14. Program on "Project Analysis and Equipment Selection" presented by a representative of the Brown & Sharpe Mfg. Co., Providence, R. I.

Hartford ASTE Meeting on Education Held at the University of Connecticut

Hartford, Conn.—The University of Connecticut at Storrs provided the setting for the annual education meeting of Hartford's ASTE chapter held on December 3.

Dean Jerome W. Howe of the Worcester Polytechnical Institute discussed the serious engineer shortage throughout the nation. He called upon industry, educational institutions and engineering societies to help alleviate the problem by encouraging more students to enter the field and by broadening the scope of educational facilities.

Other speakers were Francis L. Castleman, Jr., dean of the school of engineering at the university; Prof. Charles H. Coogan, Jr., head of the mechanical engineering department; and Errich R. Stethan, asscciate professor of mechanical engineering. They described the courses offered by the university emphasizing the curriculum provided for over 750 engineering students.

A tour of the college campus and engineering laboratories and a dinner rounded out the interesting program.

News in Metalworking . . .

HI-JET INCREASES TOOL LIFE 300-1200 PERCENT

Hi-Jet, a new method for applying cutting fluid during a metalworking operation, was recently announced by the research division of the Gulf Oil Corp., along with a special Hi-Jet oil developed for use with the equipment.

The Hi-Jet system directs small high-speed jets of oil from below the tool through the space between the work and the side relief face of the tool. The oil streams are aimed at the line of contact between the work and the cutting edge. Some of this oil actually passes the cutting edge and is caught between the tool and the chip. Evidence of this fact is that the chips as they leave the contact area are coated with oil; tool build-up is eliminated; nose wear is reduced; and the chip crater is more uniform.

It is doubtful that the high-pressure jet is powerful enough to force the oil past the cutting edge where there is a tremendous pressure. However, since the edge temperature is well above the boiling point of the oil, the liquid is vaporized and, as a vapor can be forced into the minute irregularities in the surfaces of the tool and the work surface. In the process of vaporizing, the oil picks up considerable heat from the most critical area, the cutting edge.

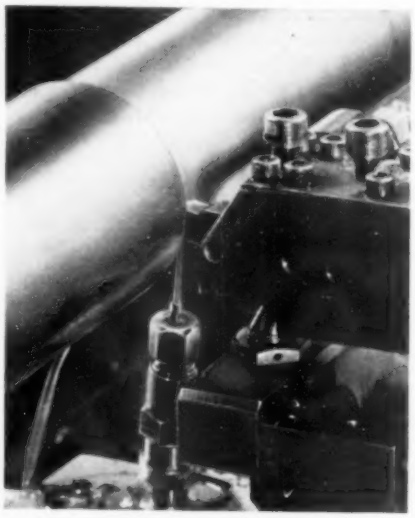
After passing the cutting edge, the hot oil vapor condenses on the cooler chip and the tool shank, and gives up the heat picked up at the cutting edge. This action partially accounts for the improved cooling action provided by the Hi-Jet system and Hi-Jet oil.

The Hi-Jet system was invented by R. J. S. Piggott, director of engineering research of the Gulf Research and Development Co. The entire unit consists of a jet, or series of jets, flexible tubing, and a small pump capable of providing a pressure of 400 psi. Thompson Products, Inc., has been licensed to manufacture the Hi-Jet mechanical system, and current tooling schedules indicate delivery of the first production units about July 1, 1952.

The new system has been used experimentally for about a year in the Gulf Laboratories, and over 600 tests have been made on a variety of metals ranging from SAE 1020 to titanium. All tests showed a considerable improvement in cutting tool life with the increase on high-speed tools from 6 to 12 times and on carbide tools from 3 to 5 times. Results of some of these tests are shown in the accompanying table.

Since the Hi-Jet oil gets to the exact point of contact between the cutting tool and work surface, there is considerably more heat carried away, and as a result a great deal more smoke is generated. For this reason a number of attachments have been developed which will serve as smoke quenchers.

One of these attachments is a series of shower heads placed above and below the cutting surface. It will utilize the available overhead flood equipment, but by using the liquid to form a thin curtain rather than a single river, it provides a much greater surface area. The addition of this equipment, however, in no way influences the operation of Hi-Jet, since it is merely a smoke quencher and is in no way a lubricant or a coolant.



A small high speed jet of oil which is aimed at the line of contact between the work and the cutting edge passes through the space between the work and the side relief face of the tool.

One of the outstanding advantages of this new system is the fact that the operator has the choice of operating his machine at conventional speeds with a greatly increased tool life or doubling, and sometimes even tripling, his speed of operation with no resultant reduction in tool life.

The cooling is greatly improved, since contact with the tool is direct, the flow velocities are far higher, and the liquid is applied in a thin sheet. The greater cooling is easily proved by the reduction of edge temperature. Two to three times the cooling is obtained with one-twentieth the oil circulation. A considerable increase in vapor and smoke (when not using an auxiliary quenching stream) shows that liquid is boiling near the cutting edge.

As a result of increased tool life, set-up and tool grinding time on many jobs can be greatly reduced. And because the tools last longer, fewer tools are needed. On large production jobs this means substantial savings in tool inventory and tool cost.

It would seem that with the tremendous improvements now made possible in high-speed tool life and cutting speeds, the use of high-speed tool steels will be greatly increased. This is especially desirable at the present time because of the scarcity of sintered tungsten carbides.

Because of the improved cooling and lubricating action on the tool radius, surface finish is greatly improved with this new method. Test results have shown a reduction in surface roughness from 200 to 60 microinches (rms). Even where improvements in surface finish are not so pronounced, greater dimensional stability usually results—the effects of tool build-up and radius wear are practically eliminated.

Table I—Overhead Flood, Conventional Coolants vs Hi-Jet with Hi-Jet Oil

STEEL	CUTTING CONDITIONS	TOOL		TOOL LIFE			
				Overhead Flood		Hi-Jet	
		Material	Shape	Oil	Time, Min.	Oil	Time Min
SAE 3150	110 sfm 0.011 in. feed 0.150 in. depth of cut	18-4-1 High-speed Steel	10-12-8-10-6-6-3/64	Mineral-Lard Sulphurized Mineral	10.02 12.60	Gulf Hi-Jet Oil	177
AISI 3140	140 sfm 0.011 in. feed 0.150 in. depth of cut	18-4-1 High-speed Steel	10-12-8-10-6-6-3/64	Sulphurized Mineral Sulphurized Lard-Sulphurized Mineral Sulphurized Lard Mineral-Lard	9.3 24.0 16.0 23.0	Gulf Hi-Jet Oil	339.5
SAE 1020	212 sfm 0.033 in. feed 0.125 in. depth of cut	18-4-1 High-speed Steel	0-8-8-8-8-5-1/32	Soluble	127	Gulf Hi-Jet Oil	19.5
AISI 416 Stainless	160 sfm 0.011 in. feed 0.150 in. depth of cut	18-4-1 High-speed Steel	10-12-8-10 6-6-3/64	Mineral	9.4	Gulf Hi-Jet Oil	163.4

TOOL AND DIE MEN SEE LIMITED CIVILIAN OUTPUT

According to a forecast by executives of the National Tool and Die Manufacturers Association, defense orders for tools and dies will practically crowd out civilian tooling during the coming year. Report from NTDMA, which represents more than 500 contract shops which produced $400 million worth of tooling in 1951 indicated many shops already turning away much of the work offered them because they are booked to capacity for months ahead. Randolph H. Cope, the association's president, said backlog in the industry will reach an all time high in 1952, with the peak of tooling orders not to be reached before mid-year.

Expansion can not be expected to take too much from the stress of the situation since the present pace already has brought about such a tight labor squeeze.

In view of the inadequacy of the tool and die maker supply and the necessity for efficient equipment with which to work, the organization's Industry Advisory Committee has requested that NPA set up a more effective means of providing machine tools for the contract tool and die shops.

Continuing in the optimistic vein, most shop owners prophesy that civilian business, postponed because of the national emergency, will take up the business slack when defense concerns ease off.

BESLY CHANGES NAME

Charles H. Besly & Company, long established tam and grinder manufacturer, has changed its corporate title to Besly-Welles Corporation. No changes in personnel or production facilities were involved in the alteration which recognized the 65-year association of the Welles family with the organization.

STEEL CASTING MOVIE OFFERED BY LEBANON

Virtually all phases of modern steel foundry operations and techniques for the production of carbon steel, special alloy and stainless steel castings are demonstrated in the recently completed 16-mm film by Lebanon Steel Foundry. The picture requires 37 minutes to show.

Slanted as a steel casting educational and informational aid, "Steel with a Thousand Qualities" is presented in a semi-technical approach keyed to understanding by a lay audience as well as technical groups.

Prints of the film are available from Modern Talking Picture Service, Inc., 45 Rockefeller Plaza, New York 20.

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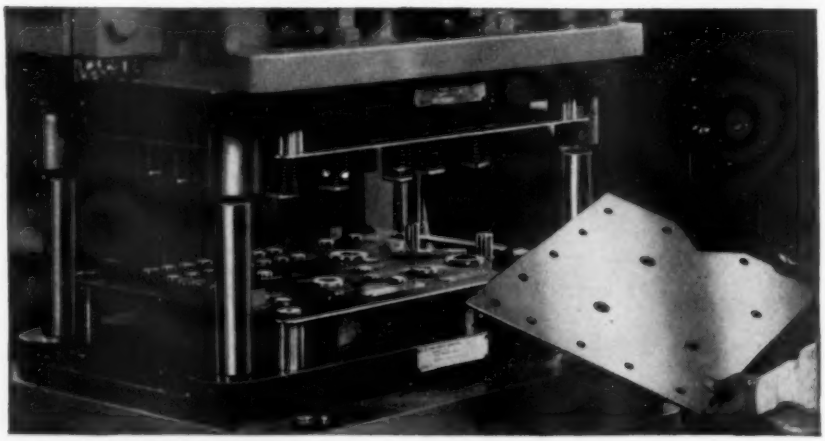
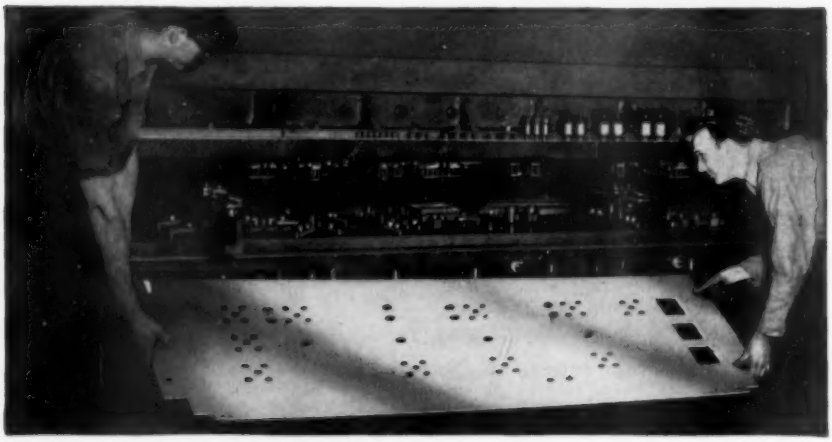
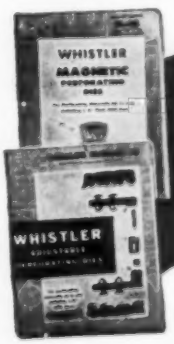


Whistler *MAGNETIC* Dies at work in large inclinable press. Magnetized units hold the retainers. No bolting required. A fast, economical method in making up a punch and die set for short or long runs. All parts re-usable.



Whistler *ADJUSTABLE* Dies on ⅛" steel perforating and notching job, using Tee slotted die set. With Whistler Adjustable Punch and Die units production starts within hours instead of weeks. Last minute job changes made quickly.



Here are the complete details with prices and application illustrations. Send for these catalogs. No obligation.

NAME

FIRM

ADDRESS

CITY ZONE STATE

S. B. WHISTLER & SONS, Inc.

Adjustable, Magnetic, Custom and Cam Dies for all Industry

744 Military Road, Buffalo 23, N. Y.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-84

LARGEST PRESS IN FIELD NEEDS OUTDOOR CONSTRUCTION

Assembly in the open air of a mammoth metalworking press to be later surrounded by roof and walls is the reversal of usual events that will take place with the installation of the press built by Birdsboro Steel Foundry and Machine Company for Lockheed Aircraft Corporation. Built at a cost of $750,000, it is the largest metalworking press in the aircraft industry.

Because of its 2,370,000-lb weight and huge size—reportedly as high as a four-story building—installation engineers had to rely on many unique ways of handling parts.

Due to the great weight plus the precision with which it has to be located, it also was necessary to design special jacks since the 160-ton crown was jacked up to a height of 20 feet above the bed to permit introduction of the 196-ton drawslide and blankholder slide sub-assembly. By cribbing and jacking, the crown was moved approximately 6 in. per hour.

The press is expected to make possible the production of large integrally stiffened wing sections and other parts without a multiplicity of nuts and bolts. Exerting 8,000 tons' pressure, it is said to form sheets in solid pieces up to 10 x 30 feet.

SHARON STEEL ABSORBS SUBSIDIARIES

According to recent announcement, Sharon Steel Corporation has liquidated into the parent company its subsidiaries The Niles Rolling Mill Company and the Brainard Steel Company, and its warehouses, the Sharonsteel Products Company (Michigan) and the Sharonsteel Products Company (Pennsylvania).

The change, according to the spokesman, was merely to simplify the company's corporate structure and involved no changes in personnel or management policies. The subsidiaries involved will operate as divisions of the parent company.

E. W. BLISS TO BUILD FOR SOUTH AMERICAN MILL

E. W. Bliss Company have been awarded a $500,000 contract for the design and manufacture of hot strip mill auxiliary equipment in the Volta Redonda, Brazil, plant of Companhia Siderurgica National (National Steel Company of Brazil).

Equipment, which includes a hot strip mill coiler, conveyors, tables and hot coil handling machinery, is scheduled for deliveries beginning the latter part of 1952.

Tools of Today . . . .

Hydraulic Machine Pierces Jet Engine Parts

A hydraulically operated automatic piercing machine was recently shown by Danly Machine Specialties, Inc., Cicero, Ill., which incorporates the Mueller power cylinder and hydraulic converter developed by the Mueller Engineering Co. of Dearborn, Mich.

The machine was designed to pierce slots in jet engine shroud rings and may also be used for piercing holes in such items as automotive tire rims and other circular parts. A unique indexing mechanism assures accurate spacing and will produce uniform parts consistently. The master index ring is interchangeable and the holes will be pierced according to the location of the slots in the master ring. An index mechanism of this type makes it possible to vary the spacing between holes or groups of holes as necessary.

A constant torque is applied to the index table and is actuated by means of a hydraulic fluid motor through a speed reducer. A large ring gear is used to drive the index table actuated by a pinion which is driven by the speed reducer.

The piercing unit is a floating type actuated by a hydraulic cylinder. The hydraulic power cylinder acts as the cross head slide. All wear surfaces are hardened and ground and its long guides provided maximum rigidity and, therefore, perfect alignment between punch and die. The cylinder is also equipped with a hydraulic stripping mechanism; consequently, no springs are required and changing of tools is much more simplified.

The hydraulically operated C-frame slide eliminates distortion of part while piercing and also part is clear of die block during index cycle, eliminating danger of marking part and wear on die block. Actual force to perform the piercing operation is equalized, and the part is merely pinched between the punch and the die with the same force on both sides, preventing distortion of the part.

The machine illustrated has a capacity of 56 tons at 10,000 psi working pressure. The hydraulic power system is completely free of high-pressure surge shocks due to the unique design of the hydraulic converter. There are no high-pressure controls except the converter itself. All directional controls and high-pressure relief valves are of standard design, either 1,000 psi for 5,000 psi operations or 2,000 psi for 10,000 psi operations. The high-pressure converter is a combination of a continuous booster and low and high-pressure admission valve. The selector spool which prevents the directional spool from shifting until the oil under compression has been releaced, and, therefore, no surge shock ever occurs. All hydraulic directional controls, including converter, are panel-mounted and easily accessible.

A pushbutton station is conveniently located for the operator and has all the control buttons necessary to actuate the machine.

The electronic controls, including the magnetic starter and line voltage to the 110-volt transformer, as well as all control releases, are mounted in an enclosed cabinet constructed according to JIC electrical standards. The push-button station is conveniently located for the operator and has all the necessary control buttons to actuate the machine. A selector switch is provided for either automatic or manual operation. The latter is for set-up purposes only. **T-2-851**

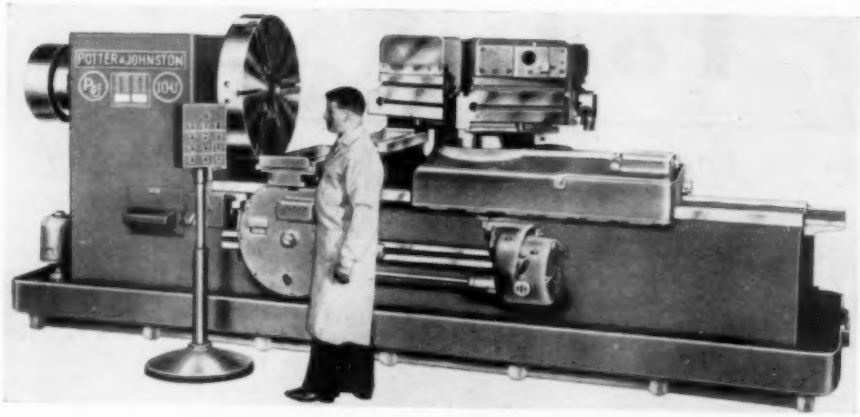
Locating Device

A multi-position locating device, said to be a major improvement in precision tool and die equipment, has been announced by the Queen City Machine Tool Co., 217 E. Second St., Cincinnati 2. Permitting jig boring or milling . . . without jigs or fixtures, the Speedi-Spacer is not permanently affixed to any particular machine. With this device any good upright drill or radial drill with an accurate spindle becomes a jig boring tool. In most instances, the device can be set up in a fraction of the time required on a jig borer or boring mill.

Positive positioning is provided by nine longitudinal and nine transverse positioning stop screws. Hardened measuring pads upon which these screws bear are an integral part of the unit.

Longitudinal and traverse movements are determined by the various settings of the screws; table position is maintained by positive locks.

The base plate of the unit has ample space for mounting screw holes to fit any machine tool. The working surfaces are provided with two standard 3/8-in. T-slots. The thrust of drilling as well as the weight of the part being machined is carried on end grain Formica bearing blocks which ride on ground steel ways. **T-2-852**



Automatic Turret Lathe

The Potter & Johnston Company of Pawtucket, Rhode Island, has announced its Model 10-U—the latest addition to the P&J line of automatic turret lathes. The 10-U is designed to handle big jobs and is equipped with a 75-hp multi V-belt drive, magnetic clutch and brake. There is a 49-in. diameter swing over base ways, a 36-in. diameter swing over cross slides for chucking and a 27-in. diameter swing over cross slides for machining.

Individual front and rear cross slides, operating from separate timing boxes, can be controlled independently or simultaneously with the movement of the turret slide. Having a 25½ in. adjustment along the bonded tool steel base ways, the front and rear cross slides and selected tools may be positioned to work from the rear and on the face of the workpiece at the same time that the turret tools are machining.

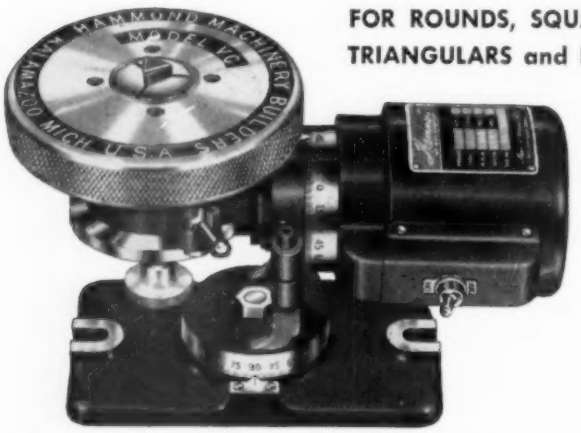
The Model 10-U includes full electro-pneumatic control, hardened and ground speed gearing, air-operated chuck and a centralized control station for operating air chuck and all machine functions. Streamline machine design provides complete accessibility to work, machine and controls.

Detailed specifications will be sent on request. T-2-861

Hammond OF KALAMAZOO
GOOD MACHINERY SINCE '82

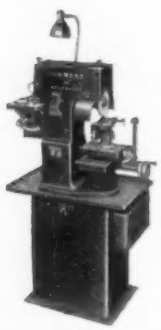
FAST ACCURATE GRINDING
of SOLID CARBIDE INSERT TOOLS

FOR ROUNDS, SQUARES,
TRIANGULARS and RECTANGULARS



MODEL VC, Style M Motorized Solid Carbide Insert Grinding Fixture. Style H, without motor also available. Write for Bulletin No. 701.

THE Hammond Solid Carbide Insert Grinding Fixture pays for itself in a few weeks. Offers a fast, economical and accurate means of grinding chip breaker grooves in round, square, triangular and rectangular shapes and for rough and finish grinding of dull and damaged carbide inserts. Motorized Style M with lug base can be mounted on most tool and surface grinders and Hammond C-4, CB-76 and CB-77 Chip Breaker Grinders.



HAMMOND MODEL CB-77 CHIP BREAKER AND DIAMOND FINISHING GRINDER can be supplied with both the standard Any Angle Vise and the Model VC Solid Carbide Insert Grinding Fixture.

BUILDERS OF AMERICA'S MOST COMPLETE
LINE OF CARBIDE TOOL GRINDERS

Hammond Machinery Builders INC.

1661 DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-86

Slitting Saw

Gay-Lee Co. announces the addition of a new, special carbide tipped "Thinsaw" for extreme precision slitting.

The new saw is available in thicknesses down to 0.030 in., with tolerance held to 0.0002 in. and in diameters up to 5 in. Ample chip clearance is provided in the new saw notwithstanding the extreme thinness. Expert workmanship, plus a specially designed circular seat produces a braze that holds the tips as securely as in cutters many times the thickness.

The new saws produce deep cuts without run-out and can be built flat with no protruding hub so that they may be lined up side by side for close multiple cutting.

For information write to Gay-Lee Co. 71 W. 14-Mile Road, Clawson, Mich. T-2-862

MEYCO

CARBIDE INSERTED DRILL JIG BUSHINGS

*PATENTED

☆ Combining the best features of steel and carbide—here is the answer to increased production and to tough drilling problems: MEYCO Carbide Inserted Drill Jig Bushings.

MEYCO bushings last as long as solid carbide bushings in most cases and cost a great deal less—they will increase the life of drill jigs, fixtures, drills and reamers—they will maintain accuracy for a much longer period of time—they will increase production, save you money in machine-down time, lost man-hours and less spoilage.

MEYCO bushings are made to A.S.A. Standards in Headless Press Fit, Head Press Fit and Fixed Renewable Types. MEYCO Bushings can also be adapted to many special applications—write for fully informative catalog No. 13 today.

Manufacturers of precision tools since 1888

W. F. MEYERS CO., INC.
BEDFORD, INDIANA

INDICATE A-2-87-1

Sheet Handling Truck

This sheet handling truck, manufactured by Market Forge Company of Everett, Mass., is designed and made to operate over wood-block or concrete floors. It can easily and quietly be moved by hand or hauled by a tractor.

While loading or unloading, floor locks on each side of the truck keep it stationary and in position; wide-faced rubber wheels in the center cushion the load, prevent damage and lessen wear and tear. These wheels also allow easy movement over uneven and rough floors. Sealed life-long lubrication ball bearings add to the smoothness of motion.

There are seven openings each 4⅜ in. wide. The deck portion of the truck is open, and is fitted with short rollers on ball bearings to allow entrance and removal of sheets.

The truck dimensions are: over-all, width, 3 ft, length, 8 ft, height, 6 ft. It has seven compartments each 4⅜ wide x 53 in. high with seven ball bearing rollers in each compartment. The unit has a capacity of 6,000 lb. **T-2-871**

Motor Starter

A combination across-the-line motor starter with circuit breaker, in which the components are mounted side-by-side, is available from Westinghouse Electric Corp.

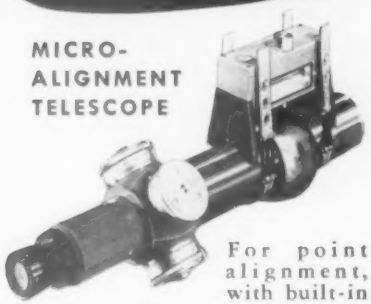
It has been developed for use where this mounting is desired for reasons of space and arrangement. This starter has the same self-indicating slamproof handle as the standard design with vertical-mounting. The handle has separate positions for on, tripped, off, reset, and open cover. It will accommodate up to three different padlocks.

This starter is available in sizes 0, 1, and 2 in sheet-steel enclosures for NEMA Types I, IA, and V. Modifications such as built-in control circuit transformer, start-stop pushbuttons, hand-off-auto selector switch, control relay, extra electrical interlocks, and inductive shunts can be supplied on special order.

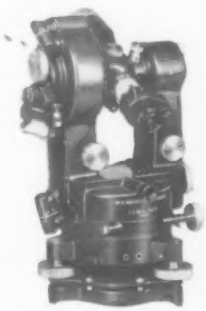
For further information, write Westinghouse Electric Corporation, Box 2099, Pittsburgh 30, Pa. **T-2-872**

ACCURATE TIME-SAVING INSTRUMENTS for OPTICAL TOOLING

MICRO-ALIGNMENT TELESCOPE



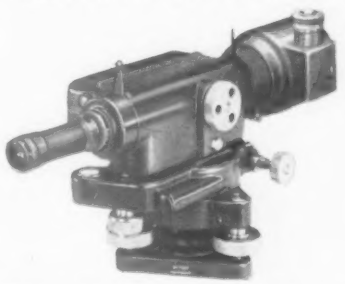
For point alignment, with built-in optical micrometers—.001" direct reading—and for precise square setting. Available with target plugs, collimating unit and auto-reflection accessories. Shown with prismatic stride level and sphere adaptor.



MICROPTIC THEODOLITES
(*Transits*)

With vertical and horizontal circles of glass fully enclosed and illuminated. Model 2—1 sec. Model 1—20 sec. Special aircraft industry models are available.

MICROPTIC LEVEL B131A



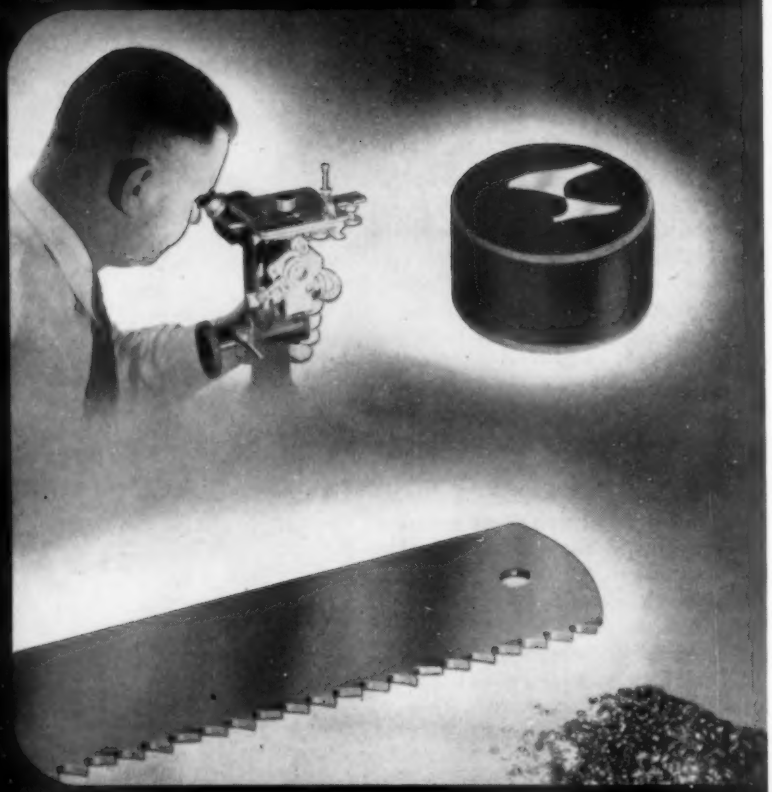
With built-in optical micrometer—direct reading to .001". Fully erect image.

See Our Exhibit Space 525
Quality Control Hall
ASTE Industrial Exposition
Or write for complete information

ENGIS EQUIPMENT CO.
431 S. Dearborn St., Chicago 5, Ill.

INDICATE A-2-87-2

SPECIALIZING IN *Your* PROBLEMS



Trained metallurgists using the most up-to-date equipment and laboratories, specialize in finding the answers to **your** toughest metal cutting problems. Here at MILFORD, modern metallurgical science is teamed with practical manufacturing know-how gained in over 75 years of specialized experience. The superb result is the MILFORD Blade that will cut more metal faster and at lower cost than ever before.

STANDARD OF QUALITY THE WORLD OVER

THE HENRY G. THOMPSON & SON CO.

SAW BLADE SPECIALISTS FOR OVER 75 YEARS

NEW HAVEN 5, CONNECTICUT

PROFILE AND BAND SAW BLADES,
HAND AND POWER HACK SAW BLADES

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-88

Grinding Machine

Carl Hirschmann Co., 30 Park Ave., Manhasset, N. Y., and 5214 Pacific Boulevard, Los Angeles 58, Calif., exclusive U. S. representative for SAFAG., S.A., Bienne, Switzerland, announce that their Swiss precision machine for grinding and lapping carbide tools has been added to the growing U. S. stocks carried at Manhasset and Los Angeles.

The new machine is identified as the Safag No. 27 hard metal tool grinding and lapping machine. It is universally applicable for all hard metal tools for any kind of Swiss or Swiss-type screw machine. T-2-881

Two New Tapes

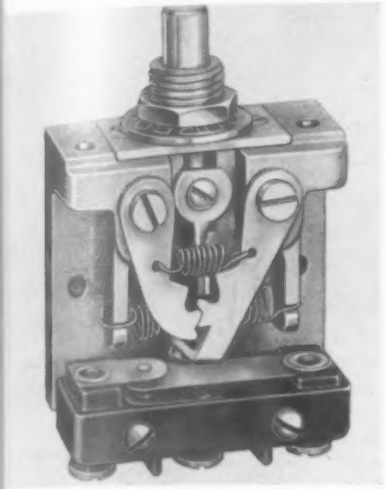
Behr-Manning Corporation, Troy, N. Y., Division of Norton Company, announces the addition of two items to its line of Behr-Cat Brand pressure sensitive tapes.

No. 211 Behr-Cat Brand strapping tape is a glass filament reinforced tape designed for heavy duty service in the fields of strapping, packaging, banding and carton sealing. Of extremely high tensile strength and resistance to handling wear, this strapping tape expedites packaging operations, assists in the binding of odd-shaped or contoured bundling and is an alternate for use where metal strapping is a weight factor or subject to curtailment. Its adhesion to both porous and smooth surfaces makes it useful for wrapping together many small parts for shipment.

No. 113 Behr-Cat Brand masking tape has been developed for the difficult operation of masking off areas on anodized aluminum and magnesium as well as castings of these materials and their alloys, particularly where such parts are to be subjected to high temperatures. T-2-882

Position Switch

General Control Co., Boston 34, Mass., has developed for industrial use a new maintained-position switch known as the A-C-O. Typical applications for



this alternate-contact-operating switch are on machine tools; circuit transfer of timers and recording equipment; in safety circuits; and as a limit switch.

The operation is such that the first press transfers the contacts and the second press restores them. Single-pole, double-throw contacts permit adaptation of this type A-C-O switch to either normally closed or normally open circuits. Unusually fast switching is permitted by the return-action design of the operating plunger mechanism, which is insulated from the contacts.

Mounting is either single-hole mounting by means of a ½ in. threaded bushing, or top or side panel mounting with clearance holes for 6-32 screws. Overall dimensions are 2 in. wide, 2-25/32 in. high including plunger, 1-3/32 in. deep. The switch is supplied with a cover enclosing the mechanical parts. Contacts are rated at 20 amperes, 125 voltes a c, non-inductive. **T-2-891**

Stacker

Industrial Engineering & Mfg. Co., Inc., Brimfield, Indiana, is now in production on a new line of stackers and power boosters identified as Universal Model 600-U Series. The new model is designed for stacking, loading or horizontal conveying of miscellaneous cartons, bags or boxed materials.

The Universal stacker and power booster is mounted on a swivel caster base with a floor-locking device. The trough is easily elevated or positioned by means of a V-type frame controlled by acme screws with hand wheels located on the side of the trough.

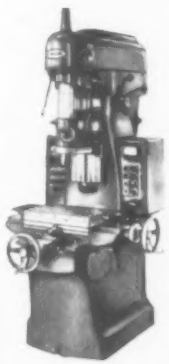
The trough is constructed of 12-gage high-tensile steel and is made in lengths of 12, 14 and 16 ft. The rough-top belt can be furnished in widths of 12, 16 and 18 in. The guard rails have an in-and-out adjustment of 6 in. to accommodate various sizes of cartons, bags or boxes.

The unit is powered by a ¾-hp, reversible motor mounted inside the channel frame, and is well protected but easily accessible for servicing.

Belt speed is 54 fpm, maintained by spur gear reduction unit. The operating mechanism is equipped with Mechano seal ball bearings requiring no lubrication. Either 24-inch length roller feeders or power belt feeders are available as optional equipment. **T-2-892**

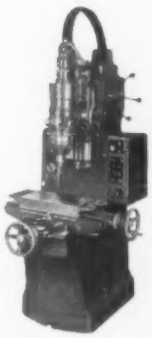
USE READER SERVICE CARD ON PAGE 103 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

NOW IS THE TIME TO PLAN AHEAD

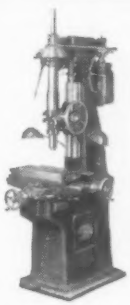


No. 2 MOORE JIG BORER, with its accurate lead screw settings within .0001", offers all the time-proven precision features associated with Moore Jig Borer construction for 15 years, plus numerous labor-saving advantages, including: increased capacity and size; infinitely variable spindle speeds; 3 power feed ratios; centralized controls.

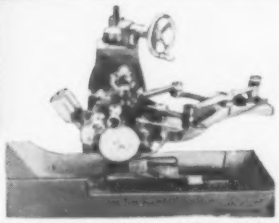
No. 2 MOORE JIG GRINDER. With this new and larger Moore Jig Grinder, *regular and irregular contours* are ground to size and location after hardening. This extends the Jig Grinder's traditional function of relocating straight and tapered holes. Holes from 1/64" to 8" can be relocated and ground within .0001"—by power or hand feed.



Four ways to cut costs and meet competition by mechanizing your toolroom.



No. 1 MOORE JIG BORER remains in the line. For its range—table working surface of 10" by 16" and cuts up to 3½"—this machine is still an ideal buy. There are over 1000 satisfied users. We will continue to offer it for the many situations where a small, accurate jig borer fills the required prescription.



MOORE PANTO-CRUSH WHEEL DRESSER speeds form-grinding and cuts costs. Both crush-forming and diamond-dressing are accomplished with this 2-in-1 unit permanently mounted on the wheel spindle of a surface grinder. You switch from one method to the other without disturbing workpiece setting.

We'll be glad to send you complete descriptive literature on any of these machines.

MOORE SPECIAL TOOL COMPANY, INC.
732 Union Ave., Bridgeport 7, Connecticut

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS · JIG GRINDERS · PANTO-CRUSH WHEEL DRESSERS · DIE FLIPPERS · MOTORIZED CENTERS · HOLE LOCATION ACCESSORIES

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-89

LET'S TALK FACTS
ABOUT FACE MILLS!
"This NELCO solid-brazed, carbide tipped mill is the best tool we've got. We get the most for our money — it's solid, rugged and dependable . . . gives better finishes, higher table feeds and turns out more work between grinds. Boy! It's a Honey!"

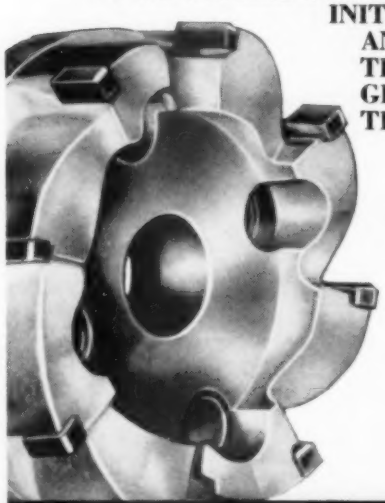
HERE'S WHY...

2 or 3 solid-brazed face mills cost *less* than 1 inserted blade type! The same initial investment provides 1 or 2 *spare* cutters which can be used while grinding the original.

There's less chance of damaging rugged, one-piece solid-brazed type cutters. No moving parts to keep aligned! . . . No loose parts to shatter, to accidentally injure workers.

A SOLID tool *has to work to closer tolerance!* It's a fact!

Solid-brazed cutters can be repaired *quickly* when damaged — No costly machined body to be re-worked or replaced. 1 blade for an inserted type cutter costs as much as 3 to 5 replaceable solid carbide cutter tips. The solid-type face mill has up to twice as much usable carbide. THEREFORE — SOLID-BRAZED FACE MILLS GIVE YOU—MUCH LOWER INITIAL COST — LOWER MAINTENANCE COST — FASTER PRODUCTION — CLOSER TOLERANCES — GREATER SAFETY and LESS DOWN TIME!



THESE ARE FACTS!...

Solid-brazed type face mills are NOT GADGETS . . . they're dependable, accurate, production-proved 1 PIECE cutting tools.

***Benefit by* proving these face-mill-facts on your machines NOW!**

NELCO TOOLS *For that Extra Edge in Production*

NELCO TOOL COMPANY, INC., MANCHESTER, CONNECTICUT

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-90

Optical Hardness Tester

Introduced in the United States for the first time is the Officine Galileo universal hardness tester. Especially designed for Rockwell and Brinell hardness tests, the instrument can be adapted to special tests and Vickers measurements.

The Galileo hardness tester gives hardness measurements following the Rockwell method, on any type of metal in the Rockwell A through F scales by direct reading. Operation of the tester is extremely simple and readings are easily taken. The tester makes use of a lever arm supported on knife edges and projects a magnified image of the hardness reading on a screen. This optical balance maintains its calibration over extended time intervals and is highly accurate.

Loads are interchanged automatically by a patented device which is controlled by an external knob. All loads are obtained by weights which insure absolute constancy of calibration. A built-in oil damper regulates the speed with which the load is applied. An external screw adjusts the speed.

Vickers measurements of 30 kg may be taken by using a pyramid diamond penetrator and a special microscope to read the diagonals of the Vickers impression.

Included as standard equipment are two test specimens, four anvils and two steel ball penetrators.

For further information, write to Metallurgical Instrument Co., 2454 West 38th St., Chicago 32, Illinois. T-2-901

USE READER SERVICE CARD ON PAGE 103 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

30 DAY DELIVERY

O-M CYLINDERS
AIR HYDRAULIC WATER

MORE POWER In less space
At LESS COST

O-M is *All* Cylinder—packing more *power* per square inch than any other type! No tie rods or bulky end caps, saves ⅓ in installation space. In full range of sizes from 1½" to 8" bores. All machined steel with bearing bronze. Parts and mounting brackets fully interchangeable. Special design standard parts applicable to almost all "custom" installations.

ORTMAN MILLER
MACHINE CO.
Hammond, Indiana

FREE
NEW CATALOG
28, diagram-packed pages of specifications, parts listing and other information.

FREE
TEMPLATES
Complete set. Shows all cylinders and mounting brackets. ½ scale.

ORTMAN-MILLER MACHINE CO.
1216 150th St., Hammond, Indiana

At no cost or obligation . . .

☐ Send me your new, complete catalog.
☐ Send me a complete set of Templates.

Name_____
Firm_____
Address_____
City_____ State_____

MAIL COUPON TODAY!

INDICATE A-2-91-1

Stock Checker's Truck

Designed to handle a variety of items or parts, this stock checker's truck, with writing table and stationary rack welded to the frame, is being manufactured by Palmer-Shile Co., 12621 Manfield, Detroit 27, Mich.

It is of all steel welded construction with three steel shelves that have a 1-in. flange all around to prevent materials from falling off. Tubular steel handle of the truck extends to form a protective bumper for stationary rack. Floor clearance is 9½ in. Overall height to top shelf is 42½ in., height between lower and center shelves, 20 in., between center and top shelves, 12 in. Height to top of writing table, 50 in. Length is 44 in. by 20 in. wide.

The truck is equipped with four 6-in. rubber-tired, roller bearing casters, two swivel ones at push handle end and two rigid ones at other end. **T-2-911**

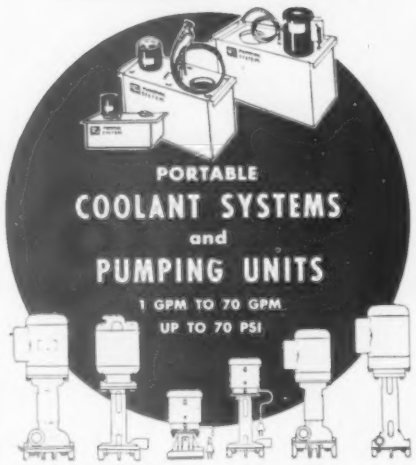
Motor Adapter Plates

Motor base adapters, manufactured by Engineering Research Association, 3475 East Nine Mile Road, Hazel Park, Mich., will fit any motor up to and including 3 hp. They fit any base with no drilling or filing. No holes are out of line and no rotor shaft is too long or too short. The motor can be shifted forward or backward to obtain the proper belt adjustment and right or left for exact pulley alignment. The tolerances—up to 3 in.—permit use of longer or shorter rotor shafts and longer or shorter belts. Thus, the interchangeability of different size motors can be made at a moment's notice without loss of time and production.

An adapter set consists of four very thin plates, eight bolts, washers and hex nuts. The plates are so shallow that the motor is not raised enough to interfere with shrouds or other surrounding objects. **T-2-912**

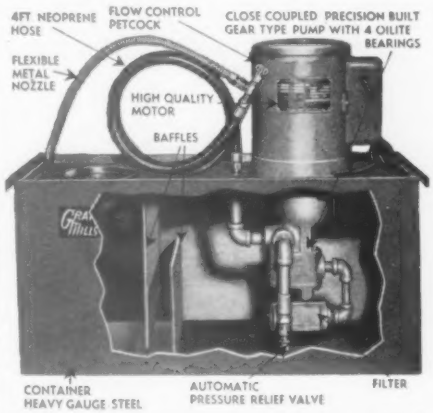
Get More Production from your Machines with

GRAY-MILLS



PROPER application of coolants mean increased production and time and tool savings. You can have these advantages for every machine—small, large, and special—with Graymills Portable Coolant Systems.

They can be installed in a few minutes, are modern in design, and of heavy duty construction with built-in automatic pressure relief valve on gear pumps.



Sturdy high pressure gear models . . . smooth high volume centrifugal types in 1/25 to ½ HP ratings, 1 gal. to 70 g.p.m. with tank capacities from 5 to 38 gals. Also immersion type centrifugal pump and motor units.

MOST INDUSTRIAL DISTRIBUTORS STOCK STANDARD UNITS.

WRITE FOR NEW CATALOG SHOWING SELECTION CHART . . . TELLS THE RIGHT PUMP OR COOLANT SYSTEM FOR THE JOB.

GRAYMILLS CORPORATION
3729 LINCOLN AVENUE • CHICAGO 13

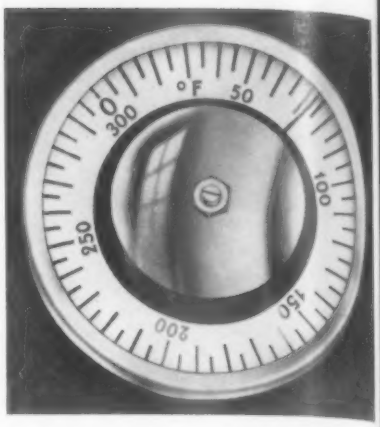
INDICATE A-2-91-2

Surface Thermometer

Pacific Transducer Co., 11921 West Pico Blvd., Los Angeles 64, Calif., announces a surface temperature thermometer for accurate checking of the outside temperature of pipes, plastic dies, and rubber molds; for checking external temperatures for wall leakage of refrigerators, cold chambers, and freezers; for checking the temperatures of journals and other bearings, electric motors, and cylinder blocks; also, for the checking of residential and industrial wall, ceiling and floor temperatures.

The instrument may be affixed to any flat surface by applying a small amount of silicone grease, which is supplied with the instrument, and sticking the thermometer in place. This silicone grease does not melt and so holds the instrument throughout all ranges of temperature, providing a thermal coupling between the surface to be measured and the instrument.

Also with the thermometer is furnished a small magnetic clamp which will hold it securely in place when applying it on steel dies or other ferrous surfaces. The thermometer may



be placed on pipes carrying heated or cooled liquid by affixing it in place by either the magnetic clamp or the silicone grease.

The thermometer has been thermodynamically designed to produce an essentially unilateral thermal instrument which indicates the temperature from the back of the instrument only. A highly reflective evaporated mirror on the dial insures the thermal element against external radiation. The range is 0 to 300 deg F calibrated in 2 deg increments.

T-2-921

Pneumatic Grinder

More speed and more power combined with less weight and less air briefly describes this new pneumatic grinder recently introduced by Desoutter. The lightest tool of its kind in the world, weighing only 12¼ ozs., the Model 0 grinder is designed for continuous, daily operation at any speed from near zero up to and including 70,000 rpm.

The elimination of nose-heaviness and torque thrust common to this type of tool, combined with its light weight, enable the operator to turn out a high standard of work over long periods of time.

The Model 6 grinder is adjustable for high and low speeds. It is controlled by push button with a convenient spring lock into On and Off positions.

All moving parts are of nickel-chrome-molybdenum steel, heat-treated. All bearings are ball or roller. The turbine rotor has highly efficient vanes affording almost complete reversal of the jet streams, thus absorbing the kinetic available. Bearing at rotor end of spindle is sealed against loss of lubricant.

Although there are 28 different shapes of grinders available by Desoutter for this tool, it will accept any standard grinder. This includes shaped grinding wheels, disc and cylindrical grinding wheels from ⅛ to ⅞ in. in diameter.

Write to Newage International, Inc., 235 East 42nd Street, New York 17, N. Y., for further information.

T-2-922

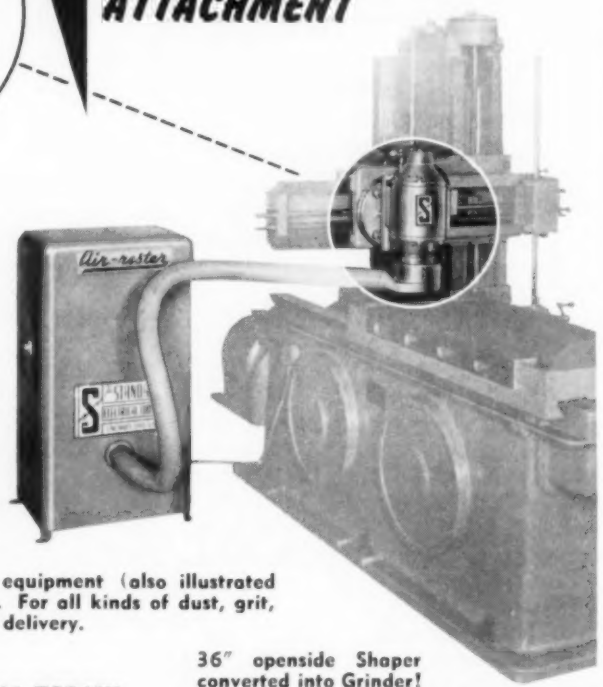
NOW... you can make your machines double purpose machines with

STANDARD'S
PRECISION GRINDING ATTACHMENT

PLANERS
BORING MILLS
SHAPERS

quickly converted!

Type PAV from ½ H.P. to 25 H.P. Speeds from 3600 to 1200 R.P.M. Equipped with vertical or horizontal feed, or both. Micrometer feeds. Hollow spindle for wet grinding. For cup wheel, plate mounted cylindrical wheels, or straight grinding wheel. "AIR-RESTER" dust collecting equipment (also illustrated and available separately). For all kinds of dust, grit, etc. Three Sizes. Prompt delivery.



36" openside Shaper converted into Grinder!
type PAV Vertical Spindle Grinder; Telescopic Wheel Guard; "Air-Rester" Dust Collecting Unit.

WRITE FOR CATALOG 44 TODAY!

the **STANDARD** electrical tool co.

2499 RIVER ROAD • CINCINNATI 4 • OHIO

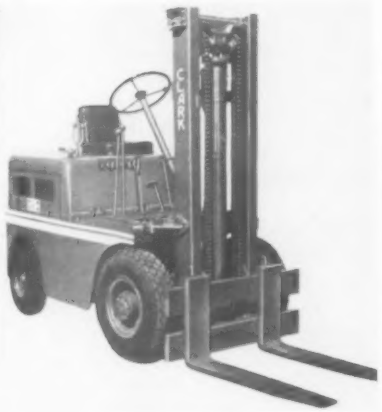
VISIT OUR BOOTH NO. 1727 AT THE A.S.T.E. INDUSTRIAL EXPOSITION, CHICAGO, ILL., MARCH 17-21

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-92

Diesel Yardlift

New diesel power for the Yardlift-40 fork-lift is available from the Clark Equipment Co., Battle Creek, Mich. Primary purpose of offering diesel power is to effect fuel-cost savings.

The engine, a Model DIX-4D by Hercules, has a bore of 3⅝ in. and a stroke of 4 in. Displacement is 166 in., giving a brake horsepower of 44 at 1950 rpm. Maximum torque developed is 118 ft/lbs. The power plant meets specifications as to performance and economy of operation.

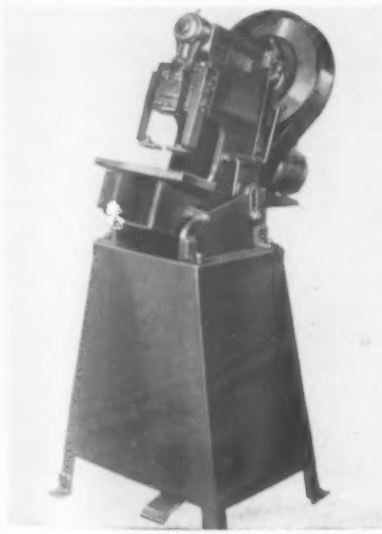


Major specifications, such as 85½ in. turning radius, overall width of 41¾ in., length, etc., remain the same with the new engine as for the present Yardlift-40. The only operating changes will be the minor ones associated with diesel operation.

Elimination of an ignition system reduces sparking dangers in areas of high inflammability—another advantage of diesel power, though the new installation cannot take the place of a fully spark-proofed vehicle. **T-2-931**

Punch Press

An inclinable punch press has been added to the Whitney-Jensen line. The press, designated the No. 127, is an open back machine which can be tilted to a maximum of 25 deg.



The flywheel of the press is to the rear rather than at the side, a design departure from conventional machines of this type. This feature rates high with operators because the out-of-the-way location of the flywheel provides a greater margin of safety as well as more elbow room when feeding stock into the press.

The press is rated at 275 strokes per minutes with a capacity of 5 tons. It is equipped with a positive non-repeat clutch which, if desired, can be released for automatic feed. Throat depth is 6 in.; height of throat is 7 in.; length of stroke is 1 in. with a stroke adjustment of 1¼ in. The machine is designed to use all standard Whitney-Jensen dies; die space being 5¾ in., with stroke down and adjustment up.

The frame of the press is of welded steel construction with a steel housing skirt included. The floor model stands 59 in. high; width at base is 22 in. and depth is 28 in. Write to Whitney Metal Tool Co., Rockford, Ill., for Catalog 16-52. **T-2-932**

USE READER SERVICE CARD ON PAGE 103 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

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FOR TURNING • FACING • THREADING • BORING

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WITH
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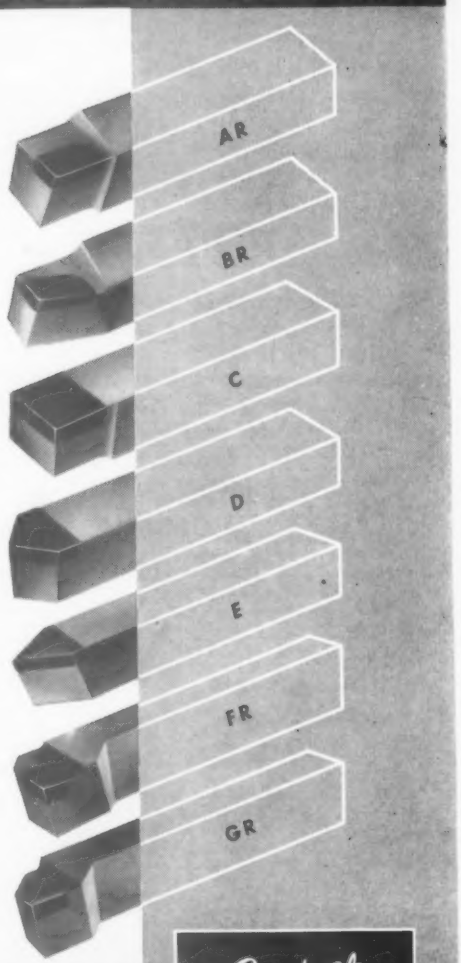
and available with
other leading carbides



Get the benefit of Super's tool making skill and still use the carbide you like.

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-93

HOW TO BUILD THE LUBRICATION PUMP INTO THE DESIGN OF YOUR MACHINES

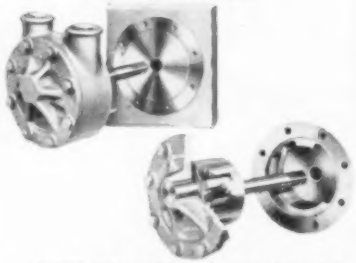
Solve Space Problems with TUTHILL *Stripped Pumps*

Here is a typical example of how a lathe manufacturer has saved space and streamlined the equipment by incorporating the Tuthill lubricating pump into the design of the headstock.

These dependable stripped pumping units are the practical answer where mounting space is limited or where it is necessary to install the pump in a special position on the machine.

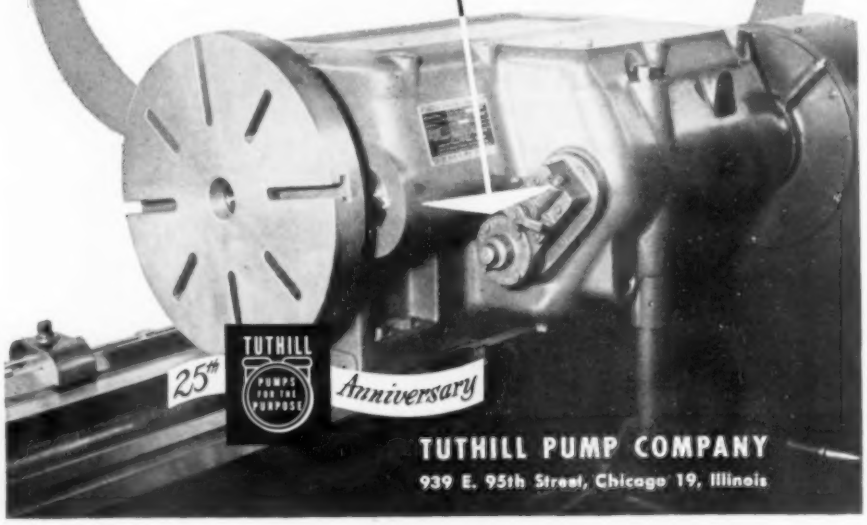
Tuthill engineers pioneered the idea of incorporating stripped pumps directly into the design of the machine, and their long experience is available to you in helping work out new designs or changes in present equipment.

TYPES AND SIZES AVAILABLE



Tuthill Stripped Pumps are offered in two types as illustrated. Type S, furnished without mounting bracket, and Type SA, which provides pumping elements only. Capacities up to 200 g.p.m. in wide pressure ranges. Stripped pumps are also available in automatic reversing models for use where the pump must be driven by a reversing shaft without changing direction of flow.

Write for details on Tuthill Stripped Pumps or submit your problem for recommendation.



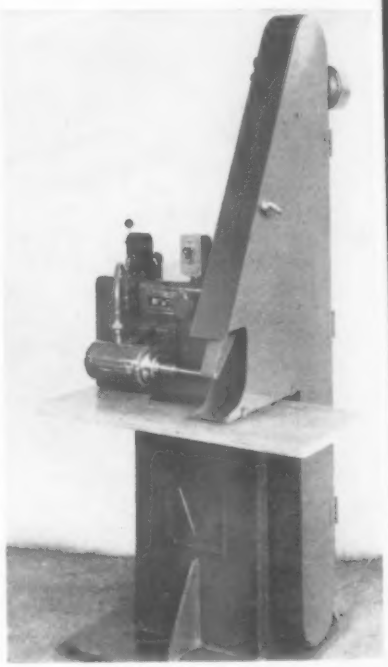
TUTHILL PUMP COMPANY
939 E. 95th Street, Chicago 19, Illinois

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-94

Belt Grinder

The Marschke HS 168 abrasive belt grinder and polisher has been developed for cleanup operations on light forgings, precision castings and deburring of small machined parts. Its primary characteristics are a pneumatically tensioned 14 ft. belt; a constant 5000 sfpm belt speed; a small contact wheel with liberal working clearances around the wheel for good visibility while the operator is in a sitting position.

The machine was designed for cleanup operations on jet blades and buckets prior to polishing, but it is recommended for similar operations on a great variety of small castings, forgings and machine parts. In addition to a maximum quality and quantity of work, the manufacturers also claim minimum abrasive cost and minimum operating fatigue.



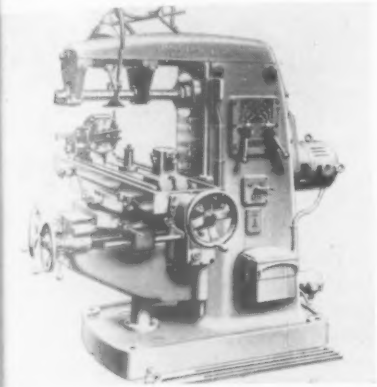
The machine is equipped with a 1½ hp, 3600-rpm, totally-enclosed motor to drive belts 1 to 2 in. wide over contact wheels from ⅝ to 2½ in. in diameter with constant, pneumatically-controlled belt tension, independent of belt stretch and contract wheel diameters.

An important feature of the machine is its high-speed contact wheel spindle which is turning at about 30,000 rpm when fitted with the minimum ⅝ in. diameter wheel and at about 15,000 rpm with a 1¼- in. wheel. For installations which do not require contact wheels of less than 1¼ in. and ranging from 1¼ to 2½ in. in diameter, the machine is equipped with a spindle unit rated for a maximum of 15,000 rpm.

For information write to the Vonnegut Moulder Corp., 1820 Madison Avenue, Indianapolis 25, Indiana. T-2-941

Milling Machines

The Jaspar line of milling machines is now available in the United States through the exclusive distributorship of Morey Machinery Co., Inc., 410 Broome St., New York 13. They are built in Liege, Belgium, by Ateliers Jaspar S. A.

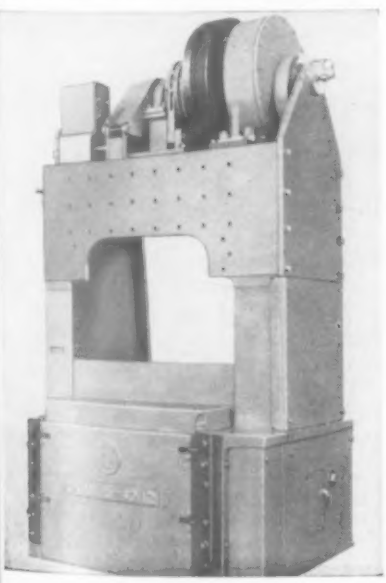


Jaspar milling machines are made in a range of models, both vertical and universal, in No. 2 and No. 3 sizes. In most instances the universal type has been designed to incorporate climb-milling attachments. The machines are heavily and sturdily built so that the tables, when used for production manufacturing, can stand the maximum speeds of tungsten carbide cutters. They are equipped with main drive motors for the spindle and a separate motor for actuating the feeds of the table.

T-2-951

Gap-type Welder

Development of a gap-frame welding press, in cooperation with a major automotive manufacturer, for use with welding fixtures in the mass production of spot welded assemblies, is announced by E. W. Bliss Co. The gap style frame permits conveyorized feeding from side to side, which facilitates easy access to the work by operators. Work is accessible from either front or back of the press.



The slide is located in the lower portion of the press and the work stroke is upward. Parts to be welded are laid on the lower "die," which contains welding tips, and moved up into contact with the fixed welding tips attached to the upper part of the press. The slide dwells in the upper position, holding the parts in contact with the electrodes until welding is completed.

Pneumatic friction clutch, flywheel and motor are located at the top of the press for cleanliness and accessibility.

Work stroke is adjustable and shut height is the same for all adjustments. Operating cycle is divided into thirds—120 deg for upstroke, 120 deg dwell, 120 deg downstroke. Each portion of the cycle takes a fraction of a second. Machine can be started and stopped at any point in the cycle under load.

Slide widths on present models range from 42 to 84 in. with 12 in. depth on all widths. Larger or smaller dimensions can be built to order. Further information can be obtained by writing to E. W. Bliss Co., Canton, Ohio.

T-2-952

Severance Regrinding Service

RECONDITIONING TO NEW-TOOL PERFORMANCE AT A FRACTION OF NEW TOOL COST!

☆ HIGH SPEED and CARBIDE ☆

Why take less?-- for Safety, Efficiency, Economy-- insist on genuine factory reconditioning service performed by Severance New Tool Craftsmen!

CONSERVE CARBIDE TOOLING

THIS BEFORE AND AFTER PICTURE SHOWS WHAT OUR NEW-TOOL CRAFTSMEN CAN ACTUALLY DO WITH YOUR BATTERED CARBIDE TOOLS OF THIS AND SIMILAR TYPES

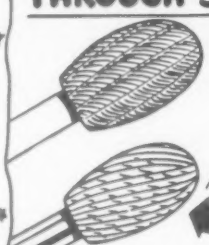
CONSERVE THROUGH REGRINDING

REPRESENTS A NEW SEVERANCE MIDGET MILL (HIGH SPEED OR CARBIDE)

REPRESENTS THE SAME TOOL AFTER 20 REGRINDS

YOUR DULL CUTTERS ARE REGROUND BY SEVERANCE NEW-TOOL CRAFTSMEN

CONSERVE THROUGH SALVAGE



YOUR DULL ROTARY FILES can be ground into MIDGET MILL TYPE TOOLS LIKE THIS

ELIMINATES LONG DELIVERY WORRIES-- Saves Your Dollars!

★ We're the Originators ★

OVER 20 YEARS EXPERIENCE IN THIS MONEY SAVING SERVICE

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DEPENDABLE DELIVERIES ARE ASSURED ★ THROUGH SEVERANCE REGRINDING SERVICE

We Regrind: MIDGET MILLS, ROTARY FILES, BURS, FILE BANDS, COUNTERBORES, COUNTERSINKS, ETC.

SEND YOUR DULL CUTTERS TO

SEVERANCE TOOL INDUSTRIES, INC.

730 IOWA AVENUE • SAGINAW, MICHIGAN

If you don't have a SEVERANCE "ALL STAR" Catalog ask for one today! It also lists Countersinks, Ball Seat Reamers and other tools of "CHATTERLESS" Tooth arrangement with the latest improvements by the originator of this type tool.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-95

Universal Grinder

The Norton 42x72-in. special universal jet part grinding machine is a heavy production grinder equipped with the universal features necessary for grinding jet engine components. It is proportioned throughout to provide stability under the heaviest production demands.

The heavy production-type wheel slide takes a 30-in. diameter grinding wheel and swivels 180 deg. by power, thus permitting rapid angular settings of the wheel for such operations as may be required. The wheel slide is clamped hydraulically and is operated automatically through an interlock on the swivel motor switch.

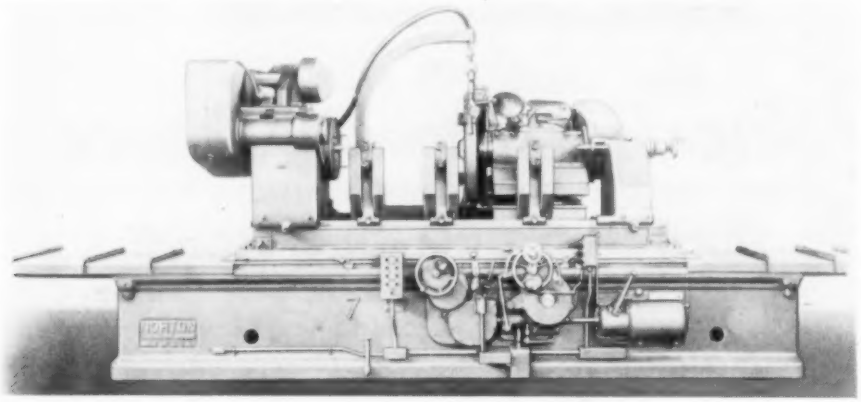
The machine grinds full diameter work (42 in.) with the full size (30-in. diameter) wheel. The wheel is rapidly positioned toward or away from the workpiece by a power mechanism which operates by moving a small lever in the center of the normal operating position. The wheel may be stopped at any point in its travel when being positioned by power.

The wheel spindle unit has long, full bearings which enclose a major portion of the spindle body, providing extreme resistance to deflection by wheel pressures. An index on the wheel feed handwheel makes possible settings in work diameter reduction as fine as 0.0001 in. Power wheel feed at table reversals is automatic and adjustable for amount of feed.

A sliding table moving on widely spaced ways supports a swivel table for grinding taper work. Both tables are heavily ribbed.

For further information, write The Norton Co., Worcester 6, Mass.

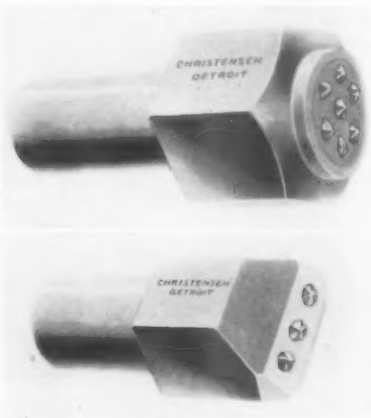
T-2-961



Dressing Tools

Group-mounted and chisel-face wheel dressing tools are two additions to the line of the Christensen Diamond Tool Co. Both types utilize a number of whole diamonds, mounted in a powdered metal matrix called C-Metal.

The group-mounted dressing tools are recommended for large OD, straight-face applications where high finish is required. Each tool contains five, six or seven diamonds, so arranged that three to five points are in contact with the work at all times. By rotating the tool in its holder at regular intervals wear is equally distributed among the various points.



Chisel-face tools have two or three diamonds mounted in a straight line, and are primarily intended for large-diameter, wide-face dressing applications. As in group-mounted tools, the diamonds used are all whole, natural stones, with the hard outer skin still intact. This outer skin, according to the manufacturer, is the toughest part of the diamond and constitutes one of the reasons for the greater dressing efficiency of multiple diamond tools.

Further details may be obtained from Christensen Diamond Tool Co., 9607 Traverse St., Detroit 13, Mich. T-2-962

USE READER SERVICE CARD ON PAGE 103 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

DESIGNERS' DREAM COME TRUE!

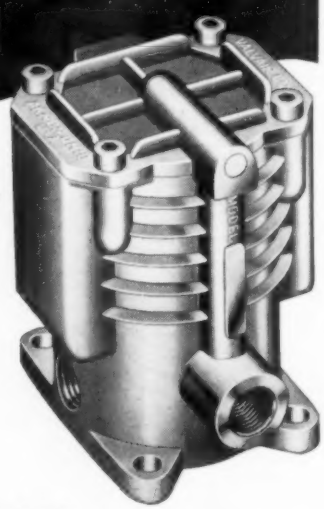
The *New* VALVAIR SOLENOID PILOT VALVE

Outstanding Features

in a New Valve PRICED ATTRACTIVELY!

- OVER 20,000,000 CYCLES
- CORROSION-PROOF
- NO OVERHEATING
- MANIFOLD MOUNTING AVAILABLE

SIZE: ¼" pipe tap, orifice ⅛" or 3/16".



The NEW Valvair Solenoid Pilot Valve is offered in 2-way and 3-way models, normally open or normally closed. Coils are completely sealed. Only two moving parts: spring and plunger. Valve life is almost unlimited.

VALVAIR CORPORATION • 979 Beardsley Avenue, Akron 11, Ohio

AFFILIATE: SINCLAIR-COLLINS VALVE CO.

Write for new Bulletin T-2.

Rely Upon Valvair — 2-WAY — 3-WAY — 4-WAY

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-96

7-Inch Industrial Sander

Compact and light (only 7½ lb), yet with ample power and capacity for continuous production use, the New Millers Falls No. 870 7-inch standard industrial sander is designed for fast sanding, wire brushing, grinding and polishing on metal, wood, tile, plastic, glass, concrete and other surfaces.

In addition to use with standard wheels, discs and brushes, it offers acceptable performance with the new laminated phenolic wheels and discs.

The sander is sturdily built and features precision machined, heat-treated alloy steel gears, pinions and spindles; grease-sealed ball and needle bearings throughout; and long-life, pigtail brushes which are easily accessible for inspection or replacement.

No-load speed is 4500 rpm. The Universal type motor is designed for dc or ac, 25-60 cycles. With a rating of 5.5 amperes at full load on 110-volt current, it delivers plenty of power for standard production work. For further information, write Millers Falls Co., Greenfield, Mass. **T-2-971**

Improved Stop-Rust

A new and improved type of rust preventative has been developed by the Industrial Research Institute of The University of Chattanooga in collaboration with The Stop-Rust Co., Chattanooga, Tenn.

Stop-Rust is not a petroleum base product. It has the unique property of absorbing and evaporating moisture from the pores of the metal. Thus it overcomes the major handicap of most antirust preparations in that it does not seal in moisture which can form rust or corrosion pockets under the protective film. Stop-Rust absorbs such entrapped moisture, floats it out to the surface and evaporates it.

Stop-Rust is a rust preventative of the removable type. It is easily applied at room temperature by brush, dip, spray or wiping on. It gives lasting protection but is readily removed by commercial solvents such as Stoddard solvent or kerosene. **T-2-972**

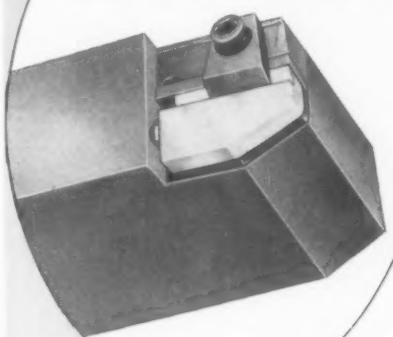
KENNAMETAL *Carbide* TOOLING

For the EXTREMES...

PRECISION BORING

and EVERYTHING in Between...

HEAVY DUTY TURNING OR PLANING



GREATER PRODUCTIVITY!

No matter what type of job you have . . . precision boring, high production, heavy cutting . . . sturdy, long-wearing Kennametal tools will enable your machines and your men to do more, in less time, at less cost. We have hundreds of performance reports to prove it—describing a wide variety of jobs on different types of materials. On many of these jobs Kennametal tooling pays for itself in savings effected in grinding, alone—not counting reduced tooling costs, and higher productivity attained. Let us demonstrate.

SEND FOR CATALOG 51

KENNAMETAL *Inc.*
Latrobe, Pa.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-97

LIPE *Automatic* Magazine Loading BAR FEED

Another Record

THE JOB . . . At L. C. Smith & Corona typewriter plant, Syracuse, N. Y., such operations as cut-off, chamfering, shaping ends, knurling were done on 14 different jobs, ranging in length from 5¼" to 16¼". A Model 00 B & S Screw Machine having a Lipe Automatic Magazine Loading Bar Feed attached, was used.

THE RESULTS . . . On running time alone, a net gain of 78% was averaged over the 14 separate jobs. And that's not all! A minimum of 30% was also gained in production because the screw machine does not "cut air" when it is left running unattended by the operator. Therefore, the overall result on these widely varied jobs is an average increase in total production of 108%.

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- *Stock is fed to screw machine all the time—not dependent on operator.*
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- *Eliminates feed fingers.*
- *Avoids multiple feed finger feed-outs.*
- *Model AML gives maximum output of machine—no "cutting air".*
- *Saves in changeover set-up time.*

Upon request we will be glad to send you a time chart showing the separate savings of the 14 jobs referred to in the case history above. Get full details on how this machine will increase production and save you money. It's today's big advancement in screw machine stock feeding. Our engineers are glad to study your problem. No obligation.

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Lipe - ROLLWAY CORPORATION
Syracuse 1, N. Y.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-98

Milling Machine

Austin Industrial Corp., 50 Church Street, New York 7, announces that it has been appointed exclusive U. S. and Canadian distributor for SAJO horizontal milling machines manufactured in Sweden.

SAJO horizontal milling machines are the medium duty, high-speed type, available in both plain and universal models. Machines are of modern design and incorporate the precision workmanship generally associated with Swedish machine tools. They are of sturdy construction and meet the highest standards of accuracy, all sliding surfaces being hand scraped. For example, guaranteed maximum spindle run out at the end of 12-in. mandrel is 0.0008 in. Accuracy test sheet accompanies each machine.

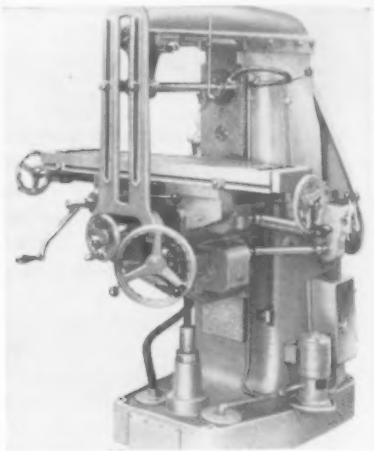

Table size for both plain and universal millers is 41½ x 9¼ in. Longitudinal power traverse is 24½ in. for the plain miller and 27½ in. for the universal miller. Transverse and vertical travel either by hand or power feed are respectively 8¼ in. (4½ in. with overarm braces in place) and 19 in.

The hardened and ground chrome-nickel steel spindle has American Standard No. 40 milling machine taper. Spindle is mounted in SKF precision roller bearings and is equipped with SKF thrust ball bearings. Machines are available with longitudinal power feed only or with power feed in longitudinal transverse or vertical directions. Twelve easily selected feed rates are available. All screws and dials are calibrated in inches.

Standard equipment supplied with either plain or universal models includes a 3-hp motor and starter equipment, motor-driven coolant pump, a 1-in. style B arbor and overarm support braces. For further information or literature please refer to Austin Industrial Corporation, 50 Church Street, New York 7, N. Y. T-2-981

Limit Switch

A new limit switch that is completely hermetically sealed is announced by the Electro-Snap Division of The Exhibit Supply Co., 4218 W. Lake St., Chicago. It is said to offer special advantages for uses under most conditions. It has many industrial applications with special

value in places where ordinary splash-proof or enclosed switches are not adequate because of humid or corrosive atmosphere, excessive dust and other difficult conditions.

Because of the hermetic sealing (with inert atmosphere), this switch is considered proof against freezing, corrosion, explosions, the accumulation of dust on contacts, tampering and misadjustments.

An important feature of the new Electro-Snap hermetically-sealed switch is a tipping diaghragm action (no sliding parts) to prevent jamming from ice formation.

The limit switch is ruggedly built. It weighs only 0.38 lb with small over-all dimensions of 2-9/16 x 1-9/16 x 1-3/16 in. Actuator is capable of more than 100,000 electrical operations or 200,000 mechanical movements. The internal switching mechanism is said to endure in excess of 10,000,000 mechanical cycles of operation.

Data sheet and other information may be obtained from The Exhibit Supply Co., 4218 West Lake Street, Chicago, Illinois. **T-2-991**

Air Scale

The F-C "air scale" weight transmitter, a completely pneumatic scale for either batch weighing or continuous process control has been announced by the Fluid Controls Company, Inc., 5150 Ridge Avenue, Philadelphia 28, Pa. The device accurately converts a variable force or weight into a pneumatic signal. Operating on the force-balance principle, the weight transmitter will indicate, record, or control weight or force through standard instruments in the manner commonly applied to temperature, flow, pressure, and level problems. Uses range from simple weighing operations to elaborate batch or continuous flow control of either solids or liquids and torque and thrust measurements of jet engines.

In operation the scale "balances out" any tare, thus allowing net weight to be indicated directly on standard panel board instruments. Accuracy of the net weight output of the air scale is limited only by the characteristics of the indicating instruments used with it.

Because the F-C "air scale" weight transmitter is completely enclosed and requires no electricity even for remote indication, explosion hazards are eliminated along with danger of damage by chemicals, corrosive materials, or dust. Thus it is adapted for use in the chemical, food processing, milling, glass and similar fields.

A unit capable of weighing up to 10,000 pounds occupies less than one cubic foot of space. Sizes are available to weigh up to 40 tons directly and higher on special order. Bulletin giving complete information and details of typical applications is available from the manufacturer. **T-2-992**

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Grinding Machine

This machine is specially designed for grinding and finishing various types of bucket blades using abrasive or felt belts by the offhand grinding method. Equipped with extended housings to mount platen rolls up to 4 in. wide, and ball bearing spindles for contact wheels up to 1 wide by 3 in. in diameter.

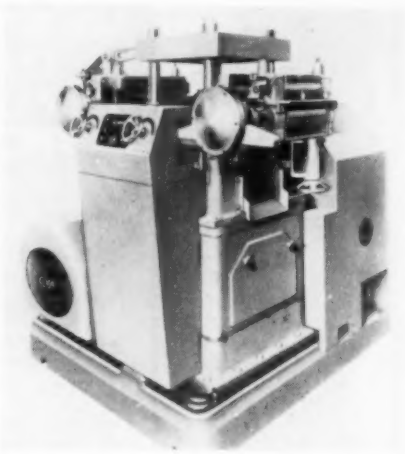
Spindles are located at a comfortable working level and permits a 180 deg wrap of abrasive or felt belt at point of contact. The contact wheels are formed to match the contour of various types and forms of blades to be ground or finished. Available in either single or duplex type so that if different grit belts are required the duplex machine may be so equipped and the operator can perform the two operations on the one machine.

The grinder uses belts up to 4 in. wide by 115 in. long running at 5000 sfm. It is manufactured by Production Machine Co., Greenfield, Mass.

T-2-1001

50-Ton Die Press

This newly designed heavy duty 50-ton die press is now available for early delivery in the United States through British Industries Corp., 164 Duane Street, New York 13. It is manufactured in England by the CVA Group.



This is a completely new 50-ton die press, with variable speed motor, centralized control panel, improved roll feed, adjustable air counter balancing, magnetic clutch and brake unit and all steel cabinet. This press has extreme rigidity, low centre of gravity, plus a modern actuating mechanism, enabling high speeds to be used with absence of vibration. Speed is infinitely variable and is provided to give optimum speed for any multi-stage tool with the additional advantage of extended die life. Feeding is easily and accurately set and automatic double roll feeds are provided, each independently adjustable to maintain progression accuracy.

T-2-1002

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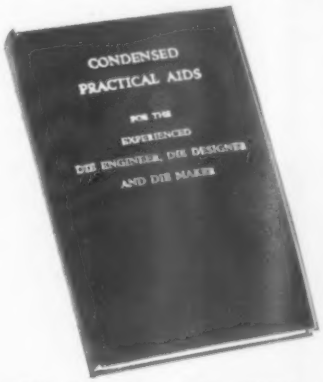

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INDICATE A-2-100-2

Precision Lathes

British Industries Corp., 164 Duane St., New York 13, is the exclusive representative in the United States for Smart & Brown Machine Tools Ltd., London, England, and is now offering for early delivery three styles of Smart & Brown precision lathes.

The model L 8-in. swing is suitable for both tool room and production purposes. It can be had with a wide range of attachments and is ideal when used as a small high speed extremely precise turret lathe.

The model M 8-in. swing shown here is a precise tool room lathe, with spindle speeds of 99 through 1950 rpm. The model A 9" swing is a precise tool room lathe, with spindle speeds of 39 to 1430 rpm.

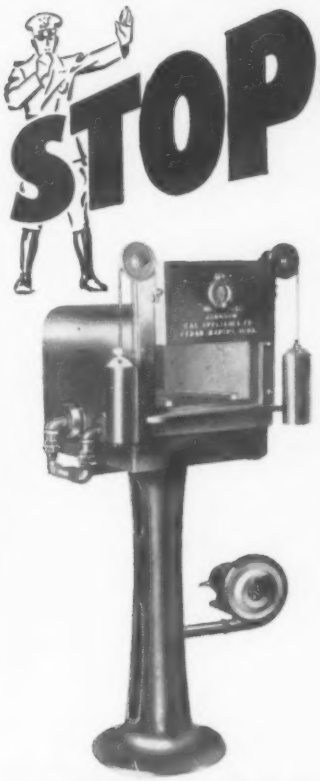
All spindles are on taper roller bearings. Machines take American collets, are calibrated in inches and are wired and motorized to American NEMA standards. **T-2-1011**

High Strength Die Steel

Now available to die casting diemakers and users is a die steel that approaches the hobbing ease of regular hobbing irons yet compares favorably with the high strength of the 5 percent chrome hot work die steels. Known as Super Samson, the steel was developed in laboratories of The Carpenter Steel Co., Reading, Pa., primarily for applications involving die casting of aluminum and zinc. It is also being used successfully in plastic mold work involving large cavities or elevated temperatures.

Super Samson is 50 to 60 percent as easy to hob as soft hobbing irons and provides an unusual combination of high strength and resistance to heat and abrasion. This unique combination of properties makes it possible for diemakers to apply the proven economies of cold hobbing to more jobs, particularly duplicate dies.

In addition, Company metallurgists claim that the new steel offers this exclusive advantage: It will harden uniformly in dies with wall thicknesses up to at least four inches. **T-2-1012**



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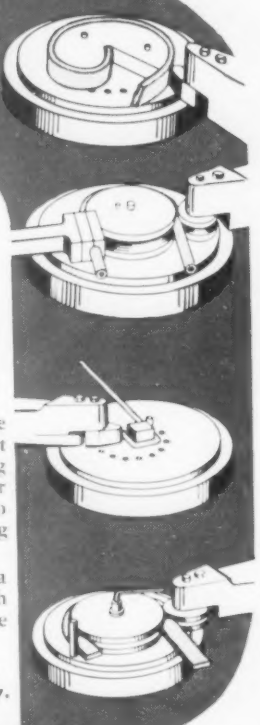

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-102

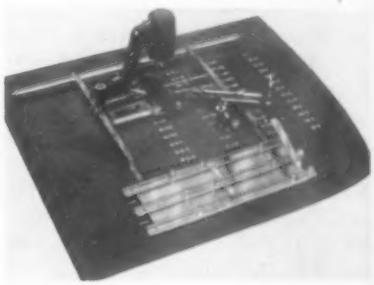
Dust Collector

A new Dustkop dust collector designed for the out-of-doors exhaust of air that has been cleaned of industrial dust, but which still contains toxic fumes, is now available for use on 25-cycle power, according to announcement by Aget-Detroit Co., 125 Main St., Ann Arbor, Mich. Being a standard unit, the Model 20ND30 has a predetermined capacity, and is from stock.

Capacity of the unit according to tests with approved testing instruments shows 2450 cfm on a single 6-in. inlet with a 4.5-in. static suction. The size of the outlet for discharge of cleaned air to atmosphere is 8 in. Floor space required is 22 x 40 in. Over-all height is 78 in.

It is available with motor for operation on either 220- or 440-volt, 3-phase, 25-cycle power; motors for operation on other power supplies can be obtained.

T-2-1021



Engraving Machine

An industrial engraving machine designed for work on panels of any dimensions has just been announced featuring a detachable chassis which, when removed from the base, may be easily placed directly on the work surface for precision engraving. Thus, panels and other surfaces need no longer be brought to the machine. Permanent installations can now be engraved where they are. Previous limitations restricting engraving areas to 25 in. are eliminated by the new model Engravograph.

The machine is tracer-guided, thus allowing unskilled labor to operate it. It is the only portable engraver manufactured capable of reproducing fifteen different sizes of letters and numbers from one master alphabet.

Another feature unique to the New Hermes Engravograph is its ability to do multiline engraving with only one set-up necessary. Special adjustable copy holding slides allow for three or more lines of engraving on a single set-up.

Write for booklet New Hermes, Inc., 13-19 University Place, New York 3.

T-2-1022

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THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

LITERATURE NUMBER	COMPANY	BULLETIN	DESCRIPTION
A-2-154-2	Ace Drill Bushing Co.	1101-2	Catalog describes drill bushing line stressing accuracy.
A-2-158	American Broach & Machine Co.	300	Circular deals with broaches and broaching problems.
A-2-32	F. E. Anderson Oil Co.		Twenty-page booklet "Lusol Gets to the Point" tells about machine cleaning, maintenance of Lusol solutions etc.
A-2-8	E. A. Baumbach Mfg. Co.		Catalog shows sizes and styles of die sets plus complete line of stamping accessories.
A-2-181-1	The Bristol Co.		Bulletin gives information on designing compact, tight assemblies, through use of right socket screw.
A-2-129	The Bullard Co.		Complete information on 4- and 5-in. spindle size Bullard horizontal boring, milling and drilling machines.
A-2-21	The Carborundum Co.	10	Booklet discusses "Maintenance of Alloy and High Speed Cutting Tools.".
A-2-154-3	Chicago Rivet & Machine Co.		Catalog contains engineering information and rivet specifications plus illustrated descriptions.
A-2-120	Chrysler Airtemp Div. of Chrysler Corp.		Information shows how Chrysler Airtemp can aid in boosting production.
A-2-185	Cincinnati Lathe & Tool Co.	D-108	Catalog tells about company's drilling tools, pointing out main features and advantages.
A-2-19	Cincinnati Shaper Co.	S-6	Complete line of Cincinnati All-Steel Shears covered in latest illustrated shear catalog.
A-2-145	Crucible Steel Co. of America		Tool Steel Selector aids in choosing proper steel for particular use.
A-2-135	Danly Machine Specialties, Inc.		Booklet "Save Tooling Time" tells advantages of tooling up with Danly Die Sets emphasizing precision features.
A-2-163	Delta Power Tool Div. Rockwell Mfg. Co.		"Drill Unit Catalog" explains special features of Delta drill units and their advantages.
A-2-100-2	"Die Techniques" Publishers	77	Brochure discusses information in compact handbook on dies.
A-2-123	The DoAll Co.		Catalog stresses efficiency and economy effected through DoAll and machining.
A-2-167	The Dumore Co.		Literature points out versatility, accuracy and other important features of company's grinding equipment.
A-2-154-1	Eastern Machine Screw Corp.		Publications deal with various lines of insert chaser die heads; threading machines; information on getting better threads; and speed chart.
A-2-115	A. B. Farquhar Co.		Catalog shows Farquhar hydraulic presses in all sizes and capacities for various types of industry.
A-2-12	Gisholt Machine Co.		General catalog covers Gisholt line of equipment.
A-2-99	Grobet File Co. of America, Inc.	HF2, HR2, F3 HB1, HC	Catalogs deal with Swiss files, rotary files, rifflers, burs and countersinks respectively.
A-2-128-1	Gorham Tool Co.		Folder describes company's "M-40-U" alloy centers including dimensions and prices.
A-2-166-3	Graham-Mintel Instrument Co.		Information on PAR-AC electric production gage stressing speed and precision in new bulletin.
A-2-91-2	Graymills Corp.		Catalog shows selection chart for choosing right pump or coolant system for the job.
A-2-160	F. T. Griswold Mfg. Co.		Illustrated catalog contains data concerning optical "Sean-A-Scale" for linear measurements to tenths.
A-2-165	Handy & Harman	20	Twenty-four page bulletin gives useful information about joint design and fast production methods.
A-2-146	Hannifin Corp.	150	Bulletin presents information on "Hy-Power" hydraulic equipment for plant production operations.
A-2-31	Illinois Tool Works		"Right and Wrong of Modern Hob Sharpening" is aimed at helping increase hob life and improve gear quality.
A-2-133	Jones & Lamson Machine Co.		Tangent and radial die catalog presents data on company's lines.
A-2-2	Landis Machine Co.	C-77	Information on many features of Landis pipe machines for users of high pressure pipe and oil tubular goods.
A-2-4	The Lapointe Machine Tool Co.	SRV-5	Folder on broaching gives data on company's line of broaching machines, tools and fixtures.
A-2-119	Logan Engineering Co.		"Better Lathes and Shapers" stresses accuracy, dependability of line. Includes specifications.
A-2-132	Metal Carbides Corp.	50-G	Catalog covers Talide (tungsten carbide) dies, blades, bushings, bar stock tools and rolls and other products stressing advantages.
A-2-87-1	W. F. Meyers Co., Inc.	13	Informative catalog on company's line of carbide inserted drill jig bushings.

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TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

LITERATURE NUMBER	COMPANY	BULLETIN	DESCRIPTION
A-2-168	Morey Machinery Co., Inc.		Fully illustrated and diagrammed circular supplies complete information on high-speed vertical profiler
A-2-149	National Broach & Machine Co.	ST49-9	Detailed description and specifications for Red Ring sounder tester for checking gears stresses speed and simplicity.
A-2-126	Norton Co.		Fifty-five pages of facts on cutting small parts finishing costs in "Barrel-Finishing with Alundum Tumbling Abrasive".
A-2-15	Norton Co.	531	Catalog gives details on 4" Type CTU hydraulic cylindrical grinder stressing dependability and other advantages.
A-2-130-1	Oakite Products, Inc.		Illustrated 44-page booklet "Some Good Things to Know About Metal Cleaning".
A-2-161	The Oilgear Co.	20000B	Bulletin deals with data on Oilgear horizontal broaching machines pointing out versatility and adaptability.
A-2-101-2	O'Neil-Irwin Mfg. Co.		Practical 32-page bending manual explains proper bending technique for particular case.
A-2-91-1	Ortman-Miller Machine Co.	28	Catalog contains diagrams, specifications parts listing etc. concerning O-M cylinders; also set of templates showing all O-M cylinders and mounting brackets.
A-2-116	Physicists Research Co.		Brochures show how Profilometer can help cut costs in production.
A-2-155	Pope Machinery Corp.	58A	Catalog cover two series of heavy duty precision motorized spindles with installation diagrams, engineering data and specifications.
A-2-178-2	Precise Products Co.		Catalog dealing with portable multi-purpose grinder-miller stressing low cost and precision.
A-2-118	R and L Tools	T	Complete specifications on all R and L Tools.
A-2-171	Rivett Lathe & Grinder, Inc.	Section 104	Catalog section covers information on Rivett hydraulic cylinders.
A-2-179	Scully-Jones and Co.	17-50	Bulletin gives detailed description and technical data on "Roll-Lock" chucking tools.
A-2-192	The Sheffield Corp.	CTP-491	Complete details on Precisionaire for obtaining multiple measurements simultaneously.
A-2-92	The Standard Electric Tool Co.	44	Informative catalog covers Standard's precision grinding attachment for converting planers, boring mills and shapers to double purpose machines.
A-2-5	Standard Gage Co., Inc.	B	Catalog presents Standard's gage line including indicating gages, dial indicators and comparators, fixed and adjustable limit gages.
A-2-34	Sun Oil Co.		Informative illustrated booklet "Cutting and Grinding Facts".
A-2-93	Super Tool Co.	Supplement 5	Net prices and full particulars concerning carbide-tipped standard tools.
A-2-139	The Timken Roller Bearing Co.		Timken Graphitic Steel Data Book presents information on company's tool steel for wide variety of uses.
A-2-96	Valvair Corp.	T-2	Bulletin covers Valvair solenoid pilot valve pointing out main features and advantages.
A-2-142	Valley Machinery & Supply Co.		Illustrated catalog presents new tip-brazing unit stressing economy and speed.
A-2-164	Van Keuren Co.	85	Catalog handbook contains specifications and prices on wire type and taper insert plug gages.
A-2-107	Vlier Manufacturing Co.	53	Economy, efficiency and performance emphasized in bulletin covering line of spring plungers and stops.
A-2-148	Walker-Turner Div. Kearney and Trecker Corp.		Complete information on company's new drill presses.
A-2-132-1	Waukesha Tool Co.		Concise catalog contains complete specifications, for all models of Waukesha cutting tools as well as description of company's manufacturing, engineering and designing facilities.
A-2-83	Wendt-Sonis Co.	52	Seventy-two page catalog presents illustrations and specifications on complete line of carbide cutting tools.
A-2-84	S. B. Whistler & Sons, Inc.		Brochures present complete details including prices and application illustrations for Whistler magnetic and adjustable dies.
A-2-152	Wiedemann Machine Co.	241	Bulletin describes production of chassis and similar work in short and semi-production runs emphasizing economy and efficiency of method.
A-2-13	The Yoder Co.		Book on cold-roll-forming presents answers to various questions and problems in this field.

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THERE is always one *right* cutting fluid for every machining job—one that will do the job better or faster, or both. Take Rudolph's problem of *rejects*. Here is what one company did about it.

THE OPERATION. Grinding the bearing surface and shoulder on engine camshafts of RC60 hardness.

MACHINES AND WHEELS. Camshaft Grinders with 80 grit wheels.

STOCK REMOVAL. Remove .036" on bearing surface and .012" to .020" on side of shoulder.

PREVIOUS RESULTS. Wheel face dressed after 8 pieces, wheel sides after 3 pieces. *Scrap loss 18%.*

WITH STUART GRINDING OIL. Wheels dressed on face and sides after 18 pieces. *No scrap loss.*

You can secure benefits like this. Ask to have a Stuart Representative call.

Are you receiving Stuart's Shop Notebook regularly?

CONSERVE CRITICAL MATERIALS — Use the RIGHT Cutting Fluid

Visit the Stuart Booth No. A-266 at the Metal Show Detroit Oct. 15-19

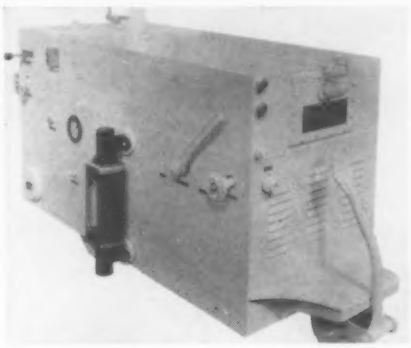
D.A. Stuart Oil Co.

2727-49 S. Troy St., Chicago 23, Illinois

INDICATE A-2-105-1

Oil Hydraulic Unit

A heavy-duty, portable oil hydraulic power unit, designed to provide hydraulic power for testing equipment, modernizing older machinery and for emergency power, is announced by The Rucker Co., 4228 Hollis St., Oakland 8, Calif. This unit is easily towed and

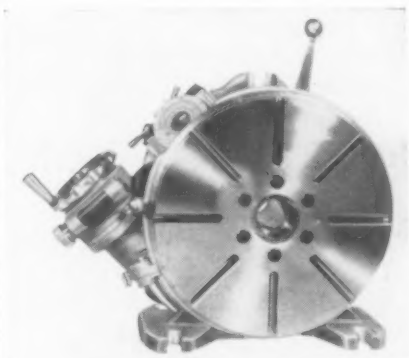


can be used anywhere electric power is available. It is especially suited to the testing of aviation and automotive equipment and the powering of machine tools and processing machinery.

These units are built with fixed volume pumps in a wide range of sizes up to 60 gpm at 2000 psi; hand wheel and pressure-compensated controls enable users to meet specific job needs up to 5000 psi and 75 hp. **T-2-1051**

Indexing Table

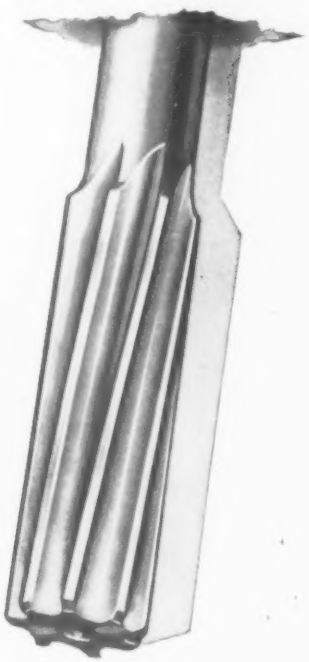
The Griswold indexing table is designed to provide a high order of accuracy in use with milling machines, jig bores, die sinkers and similar machines for indexing and rotary milling. The table may be used either in a vertical or horizontal position.



A precision engraved glass degree scale is observed directly through a telescope which, in conjunction with a circular dial, makes possible readings accurate to 0.0005 in. at the periphery of a 12 in. circle. As the diameter of the circle decreases, accuracy increases. The reading is made at a normal viewing distance.

Effects of mechanical wear, backlash and oil film thickness are eliminated. **T-2-1052**

The Finest in Quality Reamers



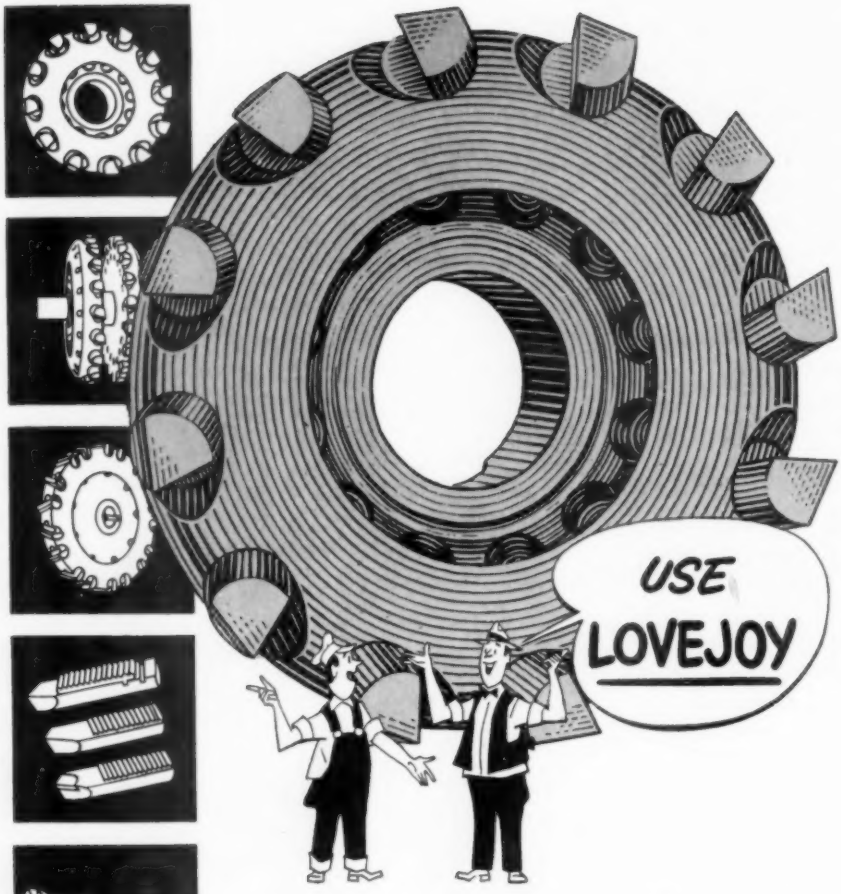
L·I

The Reamer Specialists

LAVALLEE & IDE, INC.

CHICOPEE, MASS.

INDICATE A-2-105-2



...the word from the wise in milling cutter circles

The modern Lovejoy line of inserted-tooth milling cutters are ordered and reordered on the basis of performance. Proof? . . . our first customers are still with us after 30 years of satisfaction.

The modern Lovejoy line has never been more complete. Improved new designs, both standard and special, are coming constantly from our large engineering staff.

The modern Lovejoy line features the exclusive "positive-locking" device to allow maximum use of each blade and minimum loss in sharpening.

The modern Lovejoy line of milling cutters, boring tools, arbors, flywheels, etc., plus outstanding field service, can help *you* cut your production costs, just as it has for others.

131 MAIN ST., SPRINGFIELD, VERMONT

WRITE FOR FREE CATALOGS

LOVEJOY TOOL COMPANY, INC.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-106

Technical Shorts . .

PERHAPS NOW, research men may look forward to being able to tell what exactly causes knock in a piston engine or what causes the chattering of a high-speed tool cutting steel in a lathe. At least solutions to this type of problem are considered a step closer due to recent development at Battelle Institute of a special ultra high-speed motion-picture camera.

This "research tool" is said to take pictures at speeds up to 100,000 frames per second, or about ten times the speed of most commercial high-speed cameras. In addition, a single photographic series of 500 frames can be projected as a motion picture immediately after development of the film without reprinting and re-registering of frames, according to report.

According to its designers, C. D Miller and Arthur Scharf, the Battelle camera takes all photographs through the same lens from the same viewpoint. This avoids the distortion of objects from frame to frame, which occurs when several lenses are used, the report said. It can be used to photograph luminous or non-luminous objects, for direct photography, shadowgraphs, or schlieren photography.

A ROBOT MACHINIST has been developed which is said to be capable of operating a machine tool from a distant point. According to Daco Machine and Tool Company, where the device was built, the remote control possibilities might be so broad as to make possible operation, via teletype, machine tools in a distant city and "brings closer the day of an automatic factory".

Explaining the machine as a paper-tape perforator and a sensor that translates the tape message into electrical impulses that actuate selsyn motors which tell the machine what to do, Daco engineers suggest that it might be ideal for mass production plants having long repetitive runs of metal-cutting operations. The tape can be punched out by a draftsman who makes computations from a blueprint. When the tape travels through the sensor, electrical contacts are made and broken through the holes to complete and break electrical circuits. This produces varying voltages in the sensor controlling move-

ment of the cutting tool and workpiece in the machine.

Flexible. It is claimed the "brain" may be transferred from one machine tool to another to do a completely different job.

AMONG STANDARDS recently approved by the American Standards Association are three in the field of pipe flanges and fittings. They are: B16.21-1951, on nonmetallic gaskets for pipe flanges, B16.22-1951, on wrought copper and bronze solder-joint fittings; and B16.3-1951 on malleable-iron screwed fittings, 150 lbs.

Prior to this time nonmetallic gaskets could not be manufactured and purchased according to any authoritative set of standard sizes, but were always made according to individual specifications.

The wrought copper and bronze solder-joint fittings covered in the new standard are those having not less than 83 percent copper content. A table shows pressure ratings for solder used in joints of 50-50 tin-lead or tin-antimony or 95-5 lead-tin, and solders melting at or abvoe 1100 F.

The standard on screwed fittings (a revision of the 1939 edition) now includes inspection tolerances on fitting dimensions, an amplified section on threading, and additional sizes in tables covering elbow and crosses, tees, couplings, caps and return bends.

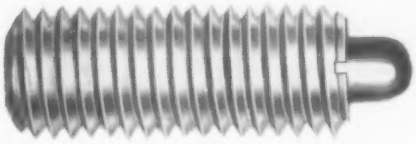
THE FIRST large-scale and self-contained plant for titanium metal production is currently being constructed at Henderson, Nevada, by Titanium Metals Corp. of America. An eight-fold increase in the world's production of titanium metal is anticipated from the project.

Terms of the contract with the government, represented by the General Services Administration, which signed the letter of intent, call for an initial production of 3600 tons of titanium metal per year. Operations are expected to reach this level by late 1952. Activity at Henderson will include the production of titanium sponge and the melting of titanium metal into ingots. The Government has awarded the company a certificate of necessity covering these installations, and has assured the proper priorities for obtaining process equipment. The Colorado River Commission has allocated an annual power supply of 151,000,000 kilowatt hours generated at nearby Hoover and Davis dams.

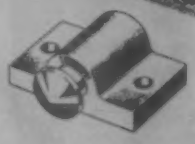
The Titanium Metals Corp., organized in January, 1950, is owned jointly by National Lead Co. and Allegheny Ludlum Steel Corp.

VLIER Spring Plungers & Stops

Save You Money in Hundreds of Ways



Here are the perfect units for replacing "makeshift" plungers in production and for end product use. Widely used for positioning small parts in fixtures, breaking oil seal in dies, as a locating pin, detents, etc. These units have long life and give trouble-free performance. Economically priced. There is a nearby Vlier distributor to serve you. Write for catalog No. 53 today.

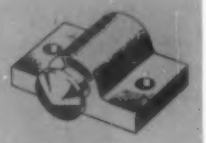


Completely assembled units, available in 13 sizes.

Pre-set, constant (3-42 lbs.) spring pressures.

Hardened plungers and rust-proof finishes give long life.

True plunger alignment in all positions.



Accurately-radiused plunger fully telescopes into body.

National Coarse Thread No. 1 fit prevents "freezing."

SPRING STOPS

For use where fixture design prevents the mounting of spring plungers. Body is jig-drilled for bolting to fixture-base. Has case-hardened, radiused nose. Available in two sizes with 14 or 32 lbs. spring pressure.

VLIER MANUFACTURING COMPANY

4552 Beverly Blvd., Los Angeles 4, Calif.

Manufacturers of

Torque Thumb Screws; Fixture Keys; Toggle Pads.

North East West South IN INDUSTRY

Among appointments recently announced by **Norton Company**, were **Dr. Newman W. Thibault**, who was named chief of a newly formed Physical Research Section of the Research and Development department; and **Richard E. Englund**, who became Grinding service engineer in charge of a new Grinding Service Section. Dr. Thibault will direct all physical research and Mr. Englund all grinding tests and other services, as well as being responsible for conducting lectures, demonstrations and instruction on grinding performance for sales, distributor and customer trainees in the company's school of grinding.

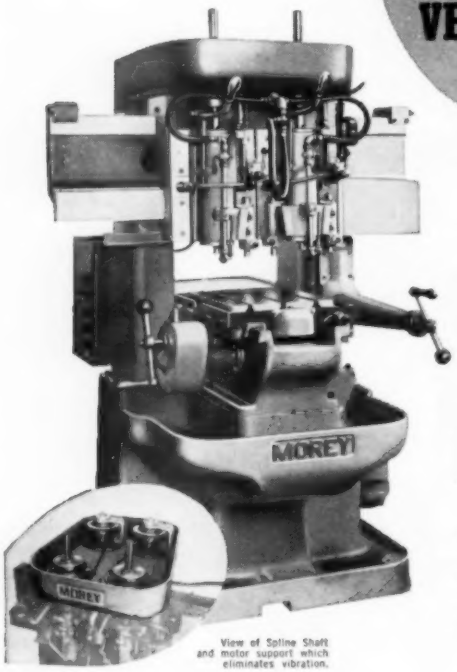
FOR RAPID, ECONOMICAL DUPLICATION OF SMALL PARTS *that require accurate interchangeability ...with minimum effort!*

INVESTIGATE

Morey

12-M DOUBLE SPINDLE HIGH SPEED

VERTICAL PROFILER and MILLING MACHINE



View of Spline Shaft and motor support which eliminates vibration.

More than 40 years of experience in designing, developing and building fine machine tools are incorporated in this dependable, time saving Profiler and Miller.

Over 2000 of these efficient machines are giving top results throughout the world . . . accurately duplicating aircraft and gun parts, etc., from a flat master.

CHECK THE MOREY PROFILER'S IMPORTANT FEATURES:

- *Balanced Cross-Slide*
- *Rigid and Vibration-free*
- *Anti-friction bearings throughout*
- *Spline shaft spindles*
- *Hardened steel ways on Cross-Slide*
- *One-shot lubrication*
- *Built-in coolant system*
- *V-Belt spindle drives*
- *• 6 WEEK DELIVERY!*

PARTIAL LISTING OF SPECIFICATIONS:

Working surface of table	14"x18"
Travel of table, longitudinal (with stops)	23" / 17¾"
Distance between spindles, center to center	12"
Spindle speeds (6)	2700-1800-1350-850-600-425
Cross rail traverse movement	32"
Motor Drive	

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At the recent annual stockholders' meeting of **Keller Tool Company**, **E. V. Erickson** was elected president of the company. At the same time, **B. P. Sherwood, Sr.**, was named chairman of the board; **R. C. Fenner**, vice-president, and **B. P. Sherwood, Jr.** secretary-treasurer.

Philip T. Sharples has been elected to the board of directors of the **Pennsylvania Salt Manufacturing Company.** Mr. Sharples is chairman of the board and former president of the Sharples Corporation and Sharples Chemicals Inc. and is president of the Sharples Oil Company.

W. Walter Wagner, head of the mechanical section of the research and development department of **Norton Company**, has retired after 33 years of service. Mr. Wagner, who is an authority on grinding and wheel performance, has authored various articles on the subject, and his name appears, as co-inventor, on patents for high-strength grinding wheels and two-fluid grinding.

OBITUARIES

Dr. Fernand Turrettini, creator of the SIP jig borers, died recently in Geneva, Switzerland, at the age of 69. At the time of his death, the scientist was active head of the **Societe Genevoise d'Instruments de Physique**. In 1950, Dr. Turrettini and his associates established the **American SIP Corporation** as United States subsidiary, and in which he was an active director.

James A. Rafferty, vice-president and director of **Union Carbide and Carbon Corporation,** died recently at the age of 65. A pioneer in the development of the synthetic organic chemical industry in this country, Mr. Rafferty also played a part in atomic energy development, arranging for collaboration of his corporation on the engineering, construction and operation of the plant at Oak Ridge, Tennessee.

Lewis A. Hastings' sudden death has been announced by **The Heald Machine Company** where he was advertising manager for the past number of years. He was 64 years old. At the time of his death, Mr. Hastings was the oldest Heald employee in point of service, having worked there for 43 years.

Raymond C. Gaugler, president of **American Cyanamid Company,** died suddenly following a cerebral hemorrhage suffered at his home in Larchmont, N. Y. Mr. Gaugler, who was 59 years of age, joined the Cyanamide organization in 1917, where he served successively as assistant treasurer and comptroller, treasurer, vice president in charge of finance, and executive vice president. He was elected president in January, 1951.

The D. C. Ball Award for Distinguished Service, made annually by **Oakite Products, Inc.** to an individual of its staff of field service representatives considered to have rendered the most outstanding service to industry during the year, was this year awarded to **J. W. Haines.** The award is in memory of David Clifton Ball, pioneer in industrial cleaning procedures and founder of the company.

Howard U. Herrick has been appointed president of **E. W. Bliss Company.** Mr. Herrick, who has been retired from active participation in the press industry during recent years, returns to active management at the request of the company's board of directors. He previously had been associated with Bliss as executive vice-president from 1934 to 1944.

Howard Herrick

Howard McGregor

According to a recent announcement, **Howard L. McGregor, Jr.** has been elected president of **National Twist Drill and Tool Company.** In this position, he succeeds his father, **Howard L. McGregor, Sr.,** who now is chairman of the board.

William M. Wallace has been appointed an assistant to the vice president of **Allis-Chalmers** general machinery division. Mr. Wallace, who has been special assistant to the manager of the processing machinery department, has been associated with the company since his graduation as a mechanical engineer in 1937 from Alabama Polytechnic Institute.

The **Alloy Casting Institute** recently elected **Harvey T. Harrison,** vice president of The Duraloy Company, as its president. Mr. Harrison, until recently vice president of the Institute, has been succeeded in that office by **R. H. English,** chief metallurgist, National Alloy Steel Div. of Blaw-Knox Company.

Hans P. Dahlstrand, outstanding American steam turbine engineer, has retired from **Allis Chalmers Manufacturing Company** after 47 years of service with the firm. Mr. Dahlstrand, who was associated with the early pioneering of steam turbine generator units and was in charge of designing many of the famous models, was also a member from 1918 to 1946 of the internationally recognized test code committee of the ASME. At the time of his retirement, Mr. Dahlstrand was director of steam turbine engineering.

A number of appointments recently have been announced by **Pratt & Whitney Aircraft** division of **United Aircraft Corporation,** as a result of increased tooling requirements. The appointments, all in the manufacturing department, include **Arthur A. Merry,** P&WA's chief tool engineer since 1940, who has been named chief of advanced tool engineering, a newly created position. **Edward P. Bullard III** was made chief of production engineering. Mr. Bullard, who has designed several types of vertical turret lathes widely used in making aircraft engine parts, was vice president in charge of engineering and production of the Bullard Company prior to his joining P&WA last year.

Coming Meetings

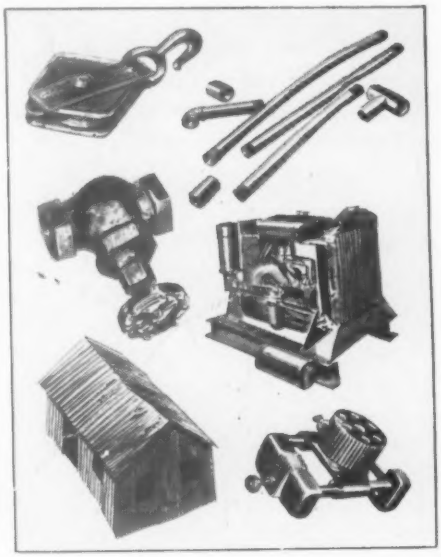
Jan. 31-Feb. 1. First midwinter technical meeting of **American Society for Metals;** William Penn Hotel, Pittsburgh.

Mar. 11-14. Fifth National Plastics Exposition, sponsored by **The Society of the Plastics Industry, Inc.** Exposition Hall, Philadelphia.

Mar. 17-21. 1952 Industrial Exposition sponsored by **American Society of Tool Engineers** simultaneously with ASTE's 20th Annual Meeting; International Amphitheatre, Chicago.

Mar. 22-Apr. 6. Chicago International Trade Fair. Navy Pier, Chicago.

PUT IDLE STEEL TO WORK



... to make NEW steel

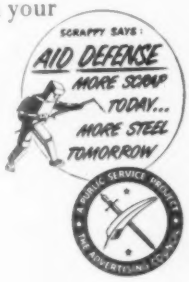
Steel mills use *one* ton of iron and steel scrap in making every *two* tons of open-hearth steel.

But normal sources of iron and steel scrap can't keep up with demand. That's why the steel industry asks you to collect your scrap—in the form of obsolete, worn-out machinery and parts—and send it back to the mill.

Only with *your* help can current military and civilian production demands be met.

Start *your* scrap salvage program today—call in your local scrap dealer *now.*

NON-FERROUS SCRAP IS NEEDED, TOO!



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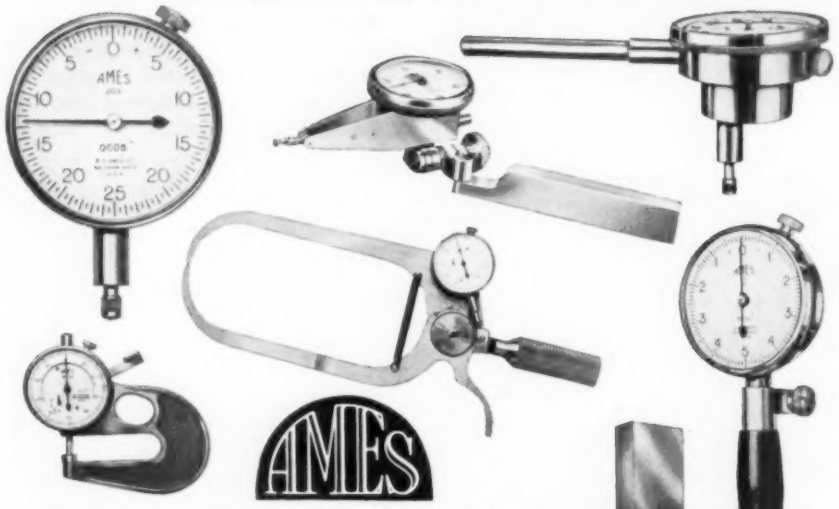
A Complete Line of Dial Indicators and Dial Gauges— for EVERY DIMENSIONAL PROBLEM



● For more than 50 years, B. C. Ames Co. has produced the highest quality micrometer dial indicators and micrometer dial gauges. That's as true today as ever—and it's one reason why Ames' Products are in such great demand — why you have to wait just a bit longer than you'd like for your order to be delivered.

As always, only the highest quality materials are used by the skilled craftsmen who build the fine line of Ames' measuring instruments. The same high standards of precision inspection insure that Ames' gauges and indicators will stay right on the job.

Represented are some of the various micrometer dial indicators and micrometer dial gauges built by Ames. They can be had to ASTM and TAPPI standards — or if you have a special measuring or quality control problem, let our engineering department assist you. We've made gauges for measuring such diverse things as primer charges and potato chips.

Write B. C. Ames Co., today.

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Good Reading

A GUIDE TO SIGNIFICANT BOOKS AND PAMPHLETS OF INTEREST TO TOOL ENGINEERS

INCENTIVE MANAGEMENT, *by James F. Lincoln. Published by The Lincoln Electric Co., Cleveland 17, Ohio. 288 pp; price, $1.00 postpaid.*

Mr. Lincoln is the president of the Lincoln Electric Co. and in this book sets forth his philosophy of life as he has applied it to his own company. Assuming control when the company was bankrupt, the author, crediting his success to the program outlined here, has made his organization one of the leaders in the field. How much credit for this success is due to incentive management the reader will have to judge for himself from his perusal of the book.

Labor-management strife is one of the continuing problems which vexes industry, considerably curtailing production, and reducing, if not eliminating entirely, the benefits to be derived from a happy relationship between the two groups. The author claims that the plan outlined in his book for the application of incentive management to industry will go a long way toward encouraging cooperation between the employer and employee, giving each a new set of values and increased satisfaction and self respect.

The book also has political implications in that the author is not in agreement with the present trend in government in its relationship to industry and the individual.

VOCATIONAL PREPARATION AND INFORMATION MANUAL, *edited by H. E. Linsley. Published by the Herbert D. Hall Foundation, Newark 5, N. J. 231 pp; price $4.00.*

Presented here in language he can understand is an integrated picture for the high school student of what American industry is, how it functions, and how he can prepare himself for a position in it. The manual traces the organization of industry in the first part of the book, and is well documented with photographs and examples. In the latter half of the book, the student is told about the employment opportunities in industry, the skills required as well as some pointers on how these can be acquired. The last chapter of the book is devoted to pointers on how to apply for a job.

A Teachers' Guide for use in conjunction with the manual is available.

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STANDARD OR SPECIAL, FOR EVERY MACHINE TOOL AND INDUSTRIAL USE

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WRITE FOR CATALOG

INDICATE A-2-111-1

A TREATISE ON MILLING AND MILLING MACHINES, *compiled by Mario Martellotti. Published by the Cincinnati Milling Machine Co., Cincinnati, Ohio. Third Edition. 896 pp; price, $8.00 postpaid.*

This third edition of one of the most extensive texts on the milling process is a definite contribution to the literature of the industry. It contains the accumulated experience of many years in the application of milling machine equipment, and contains a great fund of information, specific and detailed concerning the removal of metal by milling.

The book comprehensively describes the most advanced types and applications of milling machines, milling attachments, cutters and cutting fluid as well as unique design and types of fixtures used in tooling for production. It is based on information from the Engineering Staff of the publisher. Included are 200 formulas for solving various problems encountered in shop practice, and over 700 illustrations and charts.

MANUFACTURING EQUIPMENT AND PROCESSES, *by Charles W. Lytle and Arthur F. Gould. Published by International Text Book Co., Scranton, Pa. Third Edition, 759 pp; price, $6.50.*

This book is an outgrowth of an earlier volume, Factory Equipment, by Lytle and J. W. Roe, but because of the extensive revision and addition, it perhaps should not be called a third edition. Basically, the book aims to clarify the technicalities of the equipment and processes now used in the engineering shops in the United States. The emphasis is on the principles that should be understood before one attempts either the selection or operation of equipment.

Mechanical engineering and engineering economics are blended here. By making clear the technical potentialities of basic equipment and processes, the suitability of each kind of machine becomes apparent and any mystery that may have obscured the merits of one over another is dispelled. The simple units are brought together to explain the possibilities of automaticity, simultation and coordinated transfer, thereby reducing the most complex machines to terms that can be readily understood. The evolution of each device is traced by means of historical footnotes.

Anyone in a position to make decisions regarding mechanical equipment and processes will find here the facts necessary to choose and decide which tool is best for a given set of conditions and whether or not a replacement is justified.

ENGINEERS

TO DESIGN, REDESIGN, OR DEVELOP YOUR PRODUCT

ENGINEERS

TO TOOL AND EQUIP YOUR PLANT FOR THE BEST PRODUCTION ECONOMICS

ENGINEERS

TO GET YOUR NEW PRODUCTION GOING AND KEEP IT GOING

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INQUIRIES PROMPTLY ANSWERED

INDICATE A-2-111-2

TRADE LITERATURE

Free Booklets and Catalogs Currently Offered By Manufacturers

Taps

Illustrated, indexed 36-page comprehensive catalog of standard taps lists standardized taps available under each of six specific groups of materials for which they are specifically designed, including steel and tough materials, cast iron, aluminum and light metals, brass and plastic and bakelite. **Detroit Tap & Tool Co.**, 415 Boulevard Bldg., Detroit 2. **L-2-22**

Lathe Attachments

Catalog 5102 illustrates more than 160 different attachments and accessories for company's lathes, drill presses and shapers, including those primarily designed for use on South Bend machine tools but may be simply adapted to other makes; includes descriptions plus pertinent size, weight and ordering data. **South Bend Lathe Works**, South Bend 22, Ind. **L-2-23**

"MARVEL" HAS always had the edge

MARVEL High-Speed-Edge Blades assure Faster, more Accurate cutting with proven Economy and complete Safety. Only the MARVEL is a composite blade with a high speed steel cutting edge electrically welded to an exceptionally tough, strong alloy steel body.

The High-Speed-Edge does the cutting while the alloy back with hardened eyes, carries the load. Blade tensions up to 300% higher than those possible with ordinary blades are recommended. This greater tension is confined to the cutting or leading edge by the location of pin holes (exclusive MARVEL design feature) and cannot be overcome by work resistance. Heavier feeds and greater speeds are practical without "run out."

With greater accuracy, higher production and lower cost per cut, come the extra dividend of Safety, for MARVEL High-Speed-Edge Hack Saw Blades are Positively Unbreakable—*they will not shatter.*

Ask your local MARVEL distributor (see classified phone book) to help you modernize your metal sawing with MARVEL High-Speed-Edge Blades. They cost no more than ordinary blades.

1. High-speed-steel cutting edge.

2. Tough unbreakable alloy steel body with hardened eyes.

1. & 2. Integrally welded to make a fast-cutting, long lasting composite blade that is *positively unbreakable.*

Metal Cutting MARVEL SAWS
Better Machines-Better Blades
ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
5700 Bloomingdale Ave. Chicago 39, U.S.A.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-112

Metal Sawing

Convenient "Handbook on Metal Sawing" covers all types of metal cutting from standpoint of elementary as well as advanced instruction, widely illustrated with charts, graphs and tables to aid users and buyers of metal cutting and general industrial saws. **W. O. Barnes Co., Inc.**, Dept. H, Detroit. L-2-3

Rivet Setter

Folder describes recently introduced double rivet setter with pneumatic control, pointing out main features of its assembly, operation and advantages. Includes illustration and specifications. **Chicago Rivet and Machine Co.**, 9600 W. Jackson Blvd., Bellwood, Ill. L-2-4

Grinders, Thread and Form

Catalog condenses considerable information about line of precision thread and form grinders designed specifically for Crushtrue grinding as well as for diamond-dressed multi-ribbed and conventional single-point wheel grinding. Profusely illustrated. **The Sheffield Corp.**, Dayton 1, Ohio. L-2-5

Internal Gages

Bulletin 46 illustrates uses of versatile high precision internal gages; dimentional drawings show particulars and text points out method of use and advantages. Size and price tables included. **The Comtor Co.**, Waltham, Mass. L-2-6

Grinding

Aimed at helping train new machine operators, up-to-date handbook presents 17 chapters devoted to basic grinding facts pertaining to cylindrical grinders, while more than 90 practical illustrations dramatize operations; includes tips on how to set up jobs, how to operate precision cylindrical grinders and properly care for them, and how to turn out better jobs. Includes illustrations and descriptions of line of grinding equipment complete with specifications. **Landis Tool Co.**, Waynesboro, Pa. L-2-7

Honing

Illustrated brochure deals with honing machines for fast precision finishing internal cylinders, discussing various types of honing machines and their action, features and typical applications; descriptions of machine models, honing tools and hone bodies accompanied by specification data. C. **Allen Fulmer Co.**, 1213 First National Bank Bldg., Cincinnati 2. L-2-8

Cutting Tools

Handy visual wall chart, 15x24 in., shows tools representative of Severance line, including Carbo-mills, high-speed and carbide Midget mills and Econo-sinks. **Severance Tool Industries, Inc.,** 728 Iowa St., Saginaw, Mich. **L-2-9**

Drawing Compounds

Revised 4-page folder, "Drawing Compounds by Houghton", deals with various types of compounds including pigmented, synthetic, polar and dry film types for general purpose, non-ferrous, magnesium, aluminum and steel drawing; table presents physical properties and applications for each type. **E. F. Houghton & Co.,** 303 W. Lehigh Ave., Philadelphia 33. **L-2-10**

Motor Starters

Illustrated folder gives complete information on line of "RAS" and "RAR" multi-speed reversing motor starters said to be only half the size and weight of conventional starters; specification tables include data on dimensions, weights and ratings. **The Arrow-Hart & Hegeman Electric Co.,** 103 Hawthorn St., Hartford 6, Conn. **L-2-11**

Trucks, Electric

Complete line of electric trucks in capacities from 1,000 to 100,000 lb is described in 12-page brochure P5151 emphasizing their special features; application data and table to aid in selection also included. **The Yale & Towne Mfg. Co.,** Philadelphia Div., 11,000 Roosevelt Blvd., Philadelphia 15. **L-2-12**

Gear Finishing

Folder on "Gear Finishing—When, Where and How to Use It" describes advantages of company's process; gives various types of gears, materials and sizes that can be shaved; discusses in detail underpass, modified underpass and transverse methods plus two methods for crown shaving. **Michigan Tool Co.,** 7171 E. McNichols Rd., Detroit 12. **L-2-13**

Metal Treatment

Advantages of low-temperature metal treatment described in folder which covers such processes as low temperature chilling for stabilization of steel, increasing perishable tool life and shrinkfit assembly; technical data on methods and results of Sub-Zero chilling of different metals alloys also included, plus specifications for various machines. **Sub-Zero Products Mfg. Div., Deep-freeze Distributing Corp.,** 3928 Reading Rd., Cincinnati 29. **L-2-14**

Abrasive Cutting Wheels

Comprehensive catalog includes data on wet and dry cutting of various materials as well as information on abrasive cutting machines and their maintenance; also includes recommendations for selection of Allison rubber bonded and resinoid bonded wheels. **The Allison Co.,** 257 Island Brook Ave., Bridgeport 8, Conn. **L-2-15**

Cutter Drive

Literature describes and illustrates "Cross-Drive," a cutter driving device featuring quick changing, pre-set cutters and precision control. **The Cross Co.,** Detroit 7. **L-2-16**

Stainless Steel

Revised edition of fabricating manual, "Machining of Armco Stainless Steels", presents complete listing of grades with analyses and descriptions of grade characteristics. Includes recommended machining speeds for extra low carbon grades as well as precipitation-hardening types. **Armco Steel Corp.,** Middletown, Ohio. **L-2-17**

Collets

Folder explains engineering principle of its cam-ground "clover leaf" collet and points out its advantages over conventional type design. **Balas Collet Manufacturing Co.,** 1557 E. 27th St., Cleveland 14. **L-2-18**

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DETROIT DIE SET CORPORATION immediately on receipt of order ships all standard items in a wide range of sizes . . . dowel pins, die springs, stripper bolts, socket grip head cap screws and other accessories. All are nationally known products manufactured with the same precision as "DETROIT" die sets. For dependable shipment, 'phone, wire or write "DETROIT."
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Abstracts of Foreign Technical Literature

By M. Kronenberg

Great Britain: The Anglo-American Council on Productivity has issued a report of its specialist team which visited the United States to examine productivity in metal finishing according to an article which appeared in *The Engineer* November 30.

The team states that the conditions of economic prosperity and free enterprise in the U.S. have led to keen competition, making all ranks in industry cost conscious and open to increased mechanization to obtain greater prosperity. The team however, also found that for articles not subjected to close range scrutiny a lower standard of finish is adopted in the United States and that minor imperfections are often tolerated unless the performance of the parts suffer. On the technical side little was observed here that was not known and practiced by British manufacturers.

Sticking of valves and pumps, also known as "hydraulic lock", is often a source of difficulty to many manufacturers and users of hydraulic equipment. With the trend towards higher pressures and closer working tolerances an increase of such troubles has been noticed. The Department of Mechanical Engineering at Birmingham University has therefore carried out extensive investigations with the object of determining the causes and possible means for elimination of "locking."

An excerpt of this study has been published in *Engineering* of October 26 and November 9 by D. C. Sweeney. Among other items, the influence of hydraulic pressure on the locking force has been investigated and also the build-up of the force with time and radial movement of the spool. The experiments showed that the locking force is a function of the static oil pressure and independent of the flow through the valve. Circumferential grooving of the piston lands reduced the force substantially.

The investigation also covers the effect of macroscopic surface irregularities on pressure distribution in the valve, the effect of slightly tapered pistons, the effect of heat treatment, etc. It was found that the locking force for case hardened pistons always reached the greatest value. Numerous diagrams illustrate the results obtained for various combinations of cylinders (soft

and hard) and for pistons with different clearances made of different materials. Oil pressure, viscosity and piston displacement were likewise taken into consideration. The publication had a great response in Great Britain as verified by the fact that several discussions were mailed to the editor which either confirmed or partly disagreed with the findings. These comments were published in the issue of November 23.

If the number of errors in a hobbing machine is proportional to a whole number of cycles during a revolution of the work, the machine will generate noisy gears according to an investigation made by W. A. Tuplin of the University of Sheffield, and published in *Engineering* of October 26, November 2 and November 9. He also found that the tendency to produce noisy gears is substantially reduced when the number of error cycles of the machine is not a whole number.

The author recommends to calculate the effect of the feed of a "creep" machine before finish cutting any large helical gear and gives formulae for such calculations. The variation of the feed in a non-creep machine makes no difference to the patterns of tooth ridges but can have a substantial effect in the case of a creep machine. He recommends also that a creep fraction of about ½ is desirable in order to secure the most effective overlapping action of hob cuts.

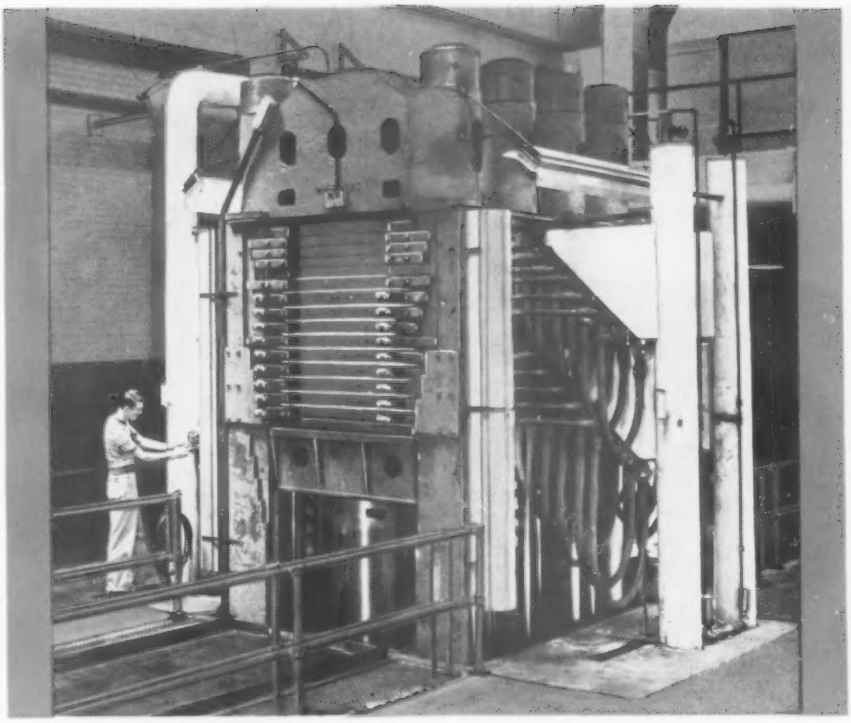
France: The development of hydraulic tracer control equipment during the past twenty years is the subject of an article by A. Vrolix in *La Machine Moderne* of November. The author has selected pertinent examples from patents issued in France and discusses the improvements in the means for obtaining high sensitivity of the tracer finger, hydraulic circuits, materials for templates for reducing friction and related topics.

Germany: Twenty-five years have elapsed since the first carbide cutting tools were put on the market by Krupp in Germany as noted in a great number of articles published in the leading periodicals dealing with tool engineering problems.

E. Altman and J. Hinueber have prepared a survey of the development of cemented carbide tools in Germany and published their findings in *Stahl & Eisen* of October 11. The article covers the influence of the microstructure, the change to tungsten carbide cobalt alloys with titanium carbides. They give examples of application and consider also the addition of tantalum carbides.

In the same magazine, C. Ballhausen reports on other improvements in the

(Continued on page 116)



NATIONAL PLASTIC thermo-sets Plastic Laminates with 3500-ton

FARQUHAR HYDRAULIC PRESS

The National Plastic Products Company, of Odenton, Maryland, required a hydraulic press for use in the thermo-setting of their NEVAMAR Plastic Laminates . . . a press that would be able to mold this material to very close tolerances.

Farquhar engineers supplied the answer with this built-to-specifications Hydraulic Press. The complete, self-contained hydraulic pumping unit has a capacity of 3500 tons. Each of the 15 hot plates has a clear working area of 50″ x 100″. Total working stroke: 49″.

The efficient Farquhar hydraulic circuit operates with a minimum number of valves —thus reducing maintenance cost considerably.

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MEASURE IN MICROINCHES RMS

What Does Belong– *in this Picture?*

...*the* PROFILOMETER *at the* NORTON SCHOOL OF GRINDING

Shown above is a customer group attending the school of grinding of the Norton Company, Worcester, Massachusetts. Here the latest grinding machine developments are explained to representatives of a number of the country's leading industrial firms.

One piece of equipment appears in this picture... the Profilometer. Obviously, in a discussion of modern grinding techniques, an accurate knowledge of the surface finishes that are secured is of primary importance. Norton Company recognizes the Profilometer as the instrument which does provide dependable roughness ratings in microinches RMS—the accepted standard of measurement throughout industry. For that reason, the Profilometer *does* belong in this picture—and on this conference table.

To the men who attend these sessions, the value of the Profilometer increases immeasurably when they put it to everyday use in the production departments of their own plants. There it becomes a part of routine grinding and other machining procedure . . . a means to secure exactly, quickly and easily the information desired on surface finishes. That is why you find it "in the picture" in their companies and wherever quality control is a consideration.

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Abstracts of Foreign Technical Literature

(Continued from page 115)

technique of manufacturing cemented carbide alloys, basing his contribution on the Report No. 10 of the Committee on Powder Metallurgy of the German Association of Mining Engineers.

The progress made in the application of carbide tools to milling operations is the topic of an article by A. Maerkle in *Werkstattstechnik und Maschinenbau* of November. He indicates that tests run at the machine tool laboratory of the Aachen University confirmed the results of M. Kronenberg's impact tests with negative rake angles published in the transactions of the ASME in 1946. In the case of milling of steel, using a face mill of 10-in. diam, the author obtained a tool life of 4000-in. length of cut at a cutting speed of 660 ft/min., 0.008 in. feed per tooth, and an equivalent feed rate of 21½ in./min. The depth of cut was 0.200 in.

A "tool life of two shifts", that is a tool life requiring regrinding after the cutter has been used in two working shifts, was obtained with a 12-in. cutter, having 12 teeth. The cutting speed was about 700 ft/min. and the feed per tooth 0.004 in.

The reduction of the cutting speed—in another application — from 700 ft/min. to about 500 ft/min. while increasing the feed rate from 16 in./min. to 28 in./min. improved the tool life 150 percent, namely from a total cut length of 40 yards to 100 yards.

In this article he also discusses the development of carbide milling cutters. Among them is a cutter with teeth having different height in axial direction. These cutters produce a stepped surface and have been used for milling heavy stock of material up to about 1½ in. depth of cut.

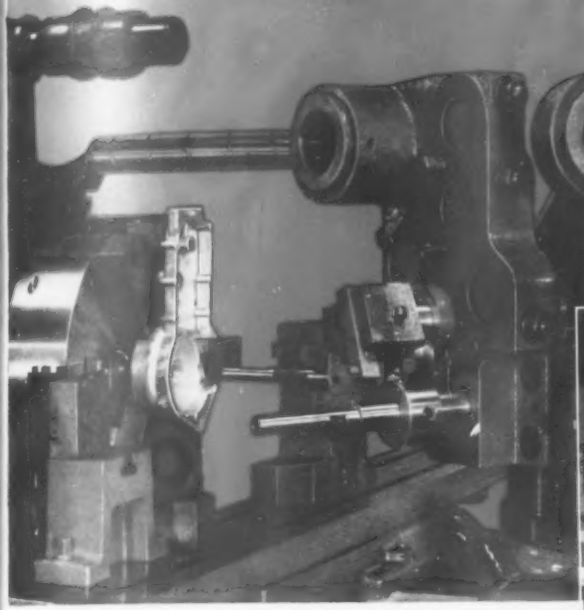
A. Duerr in an article also published in *Werkstattstechnik und Maschinenbau* of November describes the development in the design of machine tools as caused by the increasing application of sintered carbide tools. Freedom from vibration, high spindle rpm, and effective means for removing the chips are among the most important items which the designer has to consider nowadays. The article is illustrated showing examples for milling machines, lathes and drilling machines, as well as examples of elements such as sections through lathe beds designed for efficient chip removal, bearings with minimum backlash and spindle drives for a heavy milling machine.

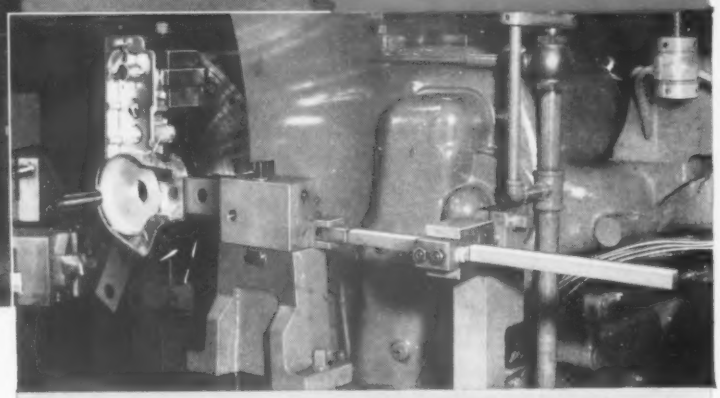
IT WILL PAY YOU WELL TO INSTALL MODERN

P&J AUTOMATICS

...ON NEW PRODUCTION

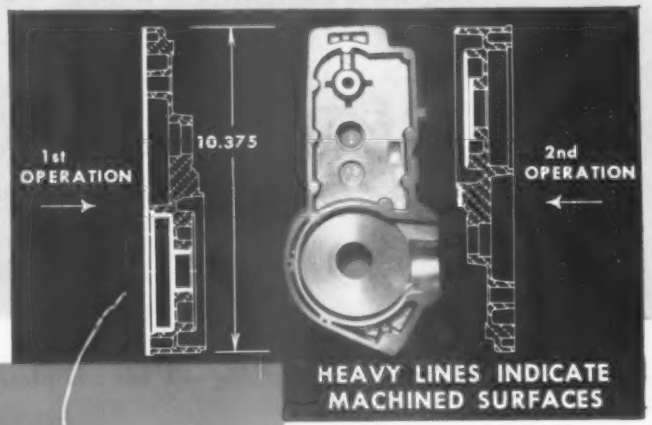
...OR AS REPLACEMENTS FOR TIRED, SLOW EQUIPMENT





This P&J engineered Facing Tool on the cross slide machines the front surface of these castings. It is self-relieving, thereby eliminating objectionable tool return marks on the face of the work.

HERE'S an example: a single P&J 5DE AUTOMATIC, equipped with standard and special Tooling designed by P&J experienced specialists, turns out these intricate housings of cast aluminum — taking 21 cuts in all for both first and second operations (see drawings at right). If you have need for *quantity production* of similar quality work, get a time estimate from P&J; no obligation.



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Precision Production Tooling for 53 years

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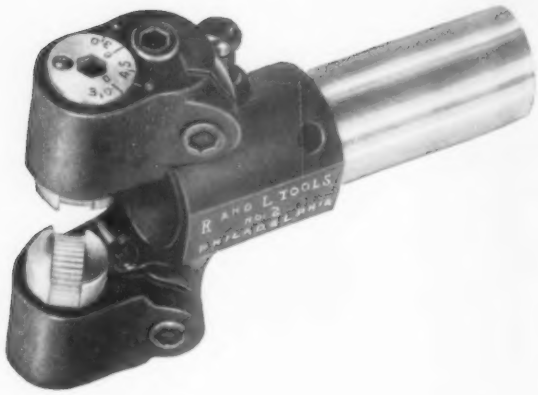
R AND L Tools

The R AND L KNURLING TOOL



LOOK FOR R AND L TOOLS
BOOTH 408
ASTE SHOW IN CHICAGO

Above is illustrated the R and L Knurling Tool—one of a line of screw machine tools designed by the experience gained from forty-five years of operating our own screw machine shop.

A very convenient feature of the R and L Knurling Tool is the position of the set screw in the knurl barrel. Located at the top of the barrel, this set screw is protected from chips, affords a better lock on the knurl pin and makes it easy to change knurls without removing the holder from the turret.

Send for our catalog—T for complete specifications on all R and L Tools listed below.

R AND L TOOLS

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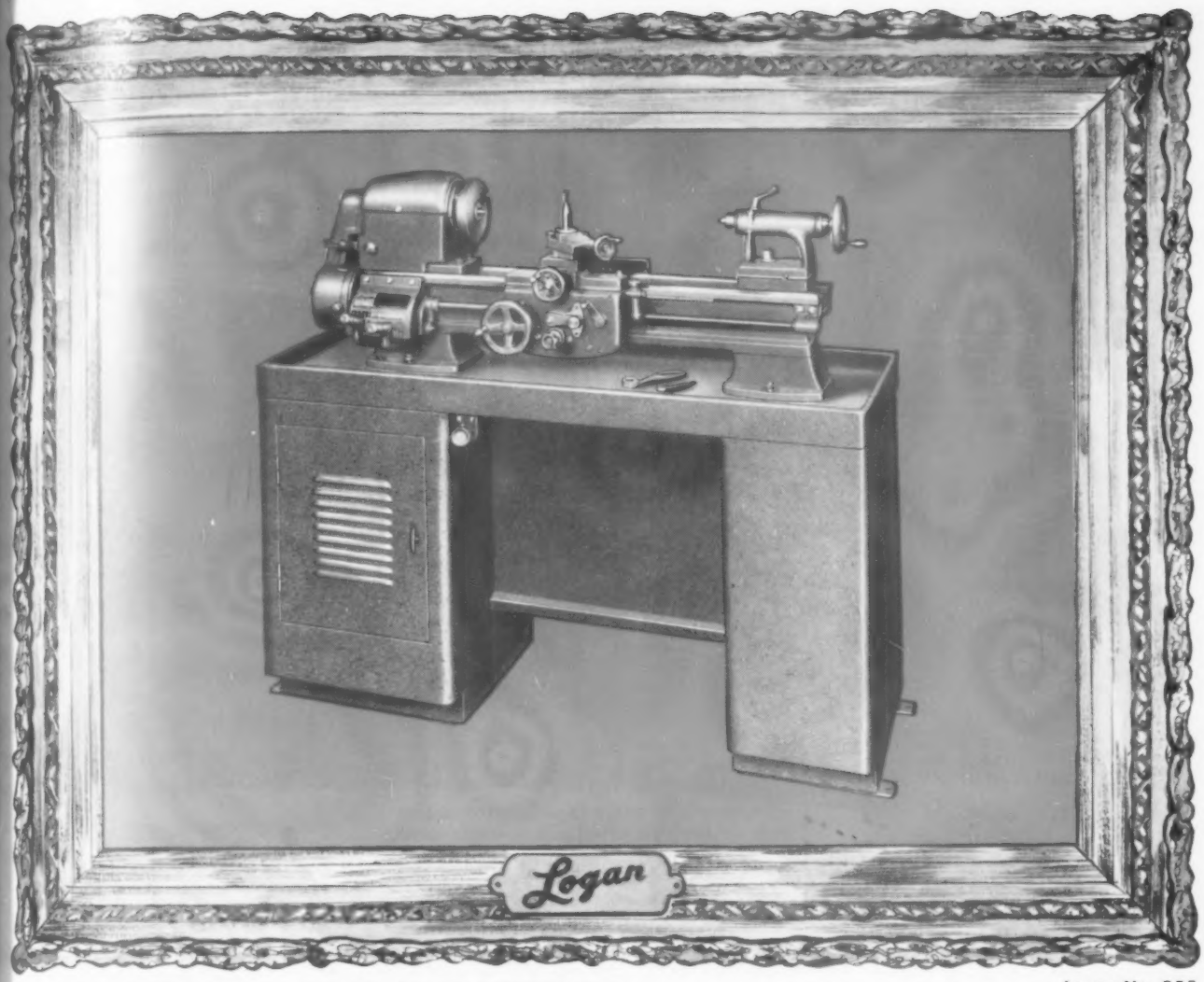
PHILADELPHIA 40, PA.

TURNING TOOL — TAP AND DIE HOLDER — UNIVERSAL TOOL POST — TURRET BACKREST HOLDER — CUT-OFF BLADE HOLDER — RECESSING TOOL
RELEASING ACORN DIE HOLDER — REVOLVING STOCK STOP — FLOATING DRILL HOLDER — KNURLING TOOL — CARBIDE AND ROLLER BACKRESTS



Logan No. 955
Quick Change Gear Lathe
11″ Swing, 1″ Collet Capacity
1⅜″ Spindle Hole

RARE PICTURE:

A *Logan* LATHE *That's Idle . .*

Look down the production lines of metal-working industry, through tool rooms, and large and small machine shops . . . you'll find the workhorse schedules assigned to Logan Lathes.

Logan Lathes keep busy because they do many jobs well. They are quickly and easily set up for any type of lathe operation, a heavy cut, a tool room precision job, a high speed production run, or large volume second operation work. Their sustained accuracy and rugged durability keep production going at top efficiency. With 11″ swing and 1″ collet capacity they handle a big percentage of any shop's work. Rugged as well as accurate, they are lathes you can depend on, not only the first year, but for years after. Remember, too, that no other lathe of comparable specifications can match the Logan in economy.

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LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

LOGAN ENGINEERING CO.
4901 West Lawrence Avenue, Chicago 30, Illinois

HEAT versus PRODUCTION ... Who Loses?

Production suffers when machines and men are exposed to high, improper temperatures.

Indoors, the worker achieves greatest efficiency in a controlled atmosphere. Intense friction heat created by high speed machining must be carefully regulated for close tolerances, limited rejects and peak performance. Here, Chrysler Airtemp can show you the way to better production. By equipping your plant or factory with Chrysler Airtemp Liquid Coolant Coolers and Air Conditioning unwarranted losses in production — manpower inefficiency, product rejects and machine failures — can be averted. Chrysler Airtemp "packaged" units are *factory-engineered* to increase and maintain peak production of men and machines.

LIQUID COOLANT COOLER • Chrysler Airtemp mechanical refrigeration for high speed machining and spot welding keeps intense friction heat at required minimum by constant and proper control of cutting oils and coolants. This control affords greater accuracy and precision plus longer tool life. Handles all types of coolants from aqua solvents to heavy tapping and hydraulic oils. Installation permits one cooler to service one or several machines. Chrysler Airtemp Radial Compressor, sealed-in from dust and dirt, operates in small, portable all-steel cabinet.

PACKAGED AIR CONDITIONERS • Compact, easily installed. Six available sizes of 2, 3, 5, 8, 11 and 15 ton. Units are factory-assembled and tested.

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Airtemp Division of Chrysler Corporation, Dayton 1, Ohio

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Dayton 1, Ohio

Please send me information showing how Chrysler Airtemp can help me boost production with "packaged" Air Conditioners and Liquid Coolant Coolers.

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DoALL PRODUCTION NEWS

...SAW BANDS...SURFACE GRINDERS...GAGING EQUIPMENT...TOOL STEEL...CUTTING TOOLS & INDUSTRIAL SUPPLIES

Vol. 1 Published by The DoALL Company, 254 N. Laurel Ave., Des Plaines, Illinois No. 1

"DoALL Surface Grinder 50% Faster; Makes Possible 30% Greater Tool Life" at Reltool Corporation, Milwaukee

Machine Rigidity and "Cool-Grinding"* Credited

The possibilities for time and cost savings possible through use of modern DoALL Precision Surface Grinders are evidenced at Reltool Corp., producers of tools and dies. According to A. G. Thomas, V. P. of Reltool, their new DoALL Grinder is approximately 50% faster and much more satisfactory than the machine previously used. Both the increased speed and 30% greater tool life is credited to the DoALL "Cool-Grinding" attachment which prevents over-heating of the work surface and to the rigidity of the machine which makes possible deeper cuts in one pass.

In DoALL "Cool-Grinding" the coolant, metered into the hub of the wheel, flows through the pores and out at the point of contact in a fine mist. There is always coolant at the contact point of wheel and work, unlike flood cooling where the wheel blasts the coolant away from the point of contact.

The unusual rigidity and precision accuracy of DoALL Grinders is evidenced in demonstrations wherein a .010" cut, with a .010" cross feed, can be taken in tool steel and the wheel backed out of the cut without "spark-out" or contact. Actually, deeper cuts have been taken without spark-out.

Your DoALL Sales-Service Store listed on the back is equipped to demonstrate DoALL Grinders at any plant. Literature is also available upon request.

*U.S. Patent No. 2470350

DoALL Saw Bands, Other Band Tools Available from Local Stocks

DoALL Stores Carry Bands for All Makes Band and Cut-off Saws

DoALL Band Tools are available in exclusive "strip-out" metal containers for safety, protection and convenience.

Because of recent enlargements of manufacturing facilities all types of DoALL band tools are now available for immediate delivery from stocks of the 35 DoALL Sales-Service Stores in North America. Bands can be purchased in lengths cut and welded to fit any machine or in 100 and 500 foot lengths. There is no limit at present to the number of feet of blade that will be sold to an individual customer.

The complete line includes 16 different types of band tools for sawing, cutting, grinding, filing, honing and polishing all metals, plastics, woods, glass, ceramics, stone, leather, paper, cloth, rubber and other non-metallics and for friction sawing metal.

"Greatest Selection of Ground Flat Stock"

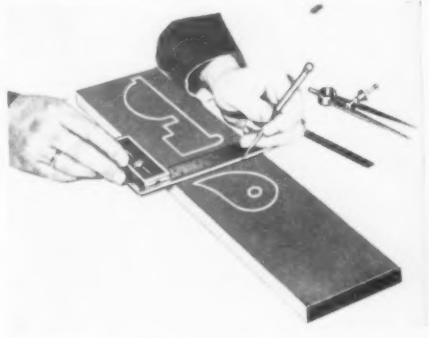
Available Locally for Immediate Delivery

Over 200 standard sizes of Precision Ground Oil Hardening Tool Steel, the greatest selection of sizes available anywhere, can now be delivered immediately by the 35 DoALL Sales-Service Stores in the United States, Canada and Mexico. Special sizes can also be supplied on short notice.

Users can order the size best suited to their needs for making tools, dies, gages and parts, thereby minimizing waste and reducing costs.

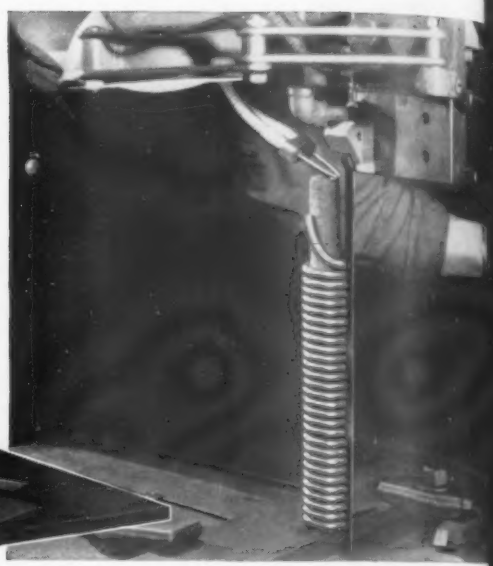
DoALL Ground Flat Stock is of highest quality and uniform analysis and is individually packaged for protection of the steel and convenience in handling.

Information and copies of the convenient new 11¾" by 17" Wall Chart listing all standard sizes of DoALL Ground Flat Stock can be secured from your local DoALL Sales-Service Store listed on the back.



Layout on DoALL Ground Flat Stock made with DoALL Steel Ink — ready for cutting on a DoALL Band Machine.

DoALL BAND SAWS SAVES MAN HOURS



BAND MACHINING DOES JOB IN ⅓ THE TIME — this job of splitting rings from coiled ¼" cold rolled steel was formerly done on an expensive milling machine. On a DoALL Contour-matic it is done *in ⅓ the time and at far less cost!*

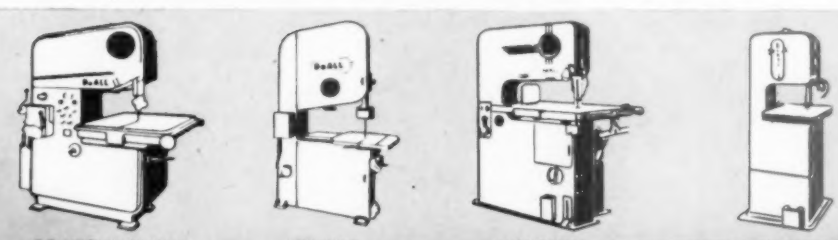
THE DoALL CONTOUR-MATIC (illustrated at upper left)

This is the most versatile, fastest cutting machine ever introduced to American Industry. It will pay for itself faster than any other machine tool equipment you can buy. Anyone can learn quickly to operate it. Its 40 to 10,000 feet per minute speed range, its hydraulic and automatic controls, its labor-saving accessories make it the most productive band machine in the world and one of the most valuable single pieces of equipment you can own.

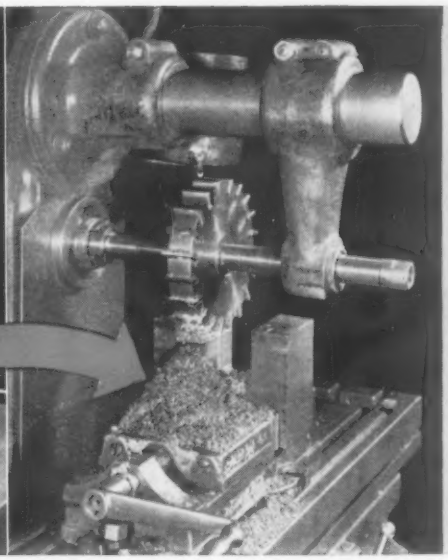
SAW BANDS, OTHER BAND TOOLS FOR EVERY PURPOSE
Immediate Delivery from Local Stocks

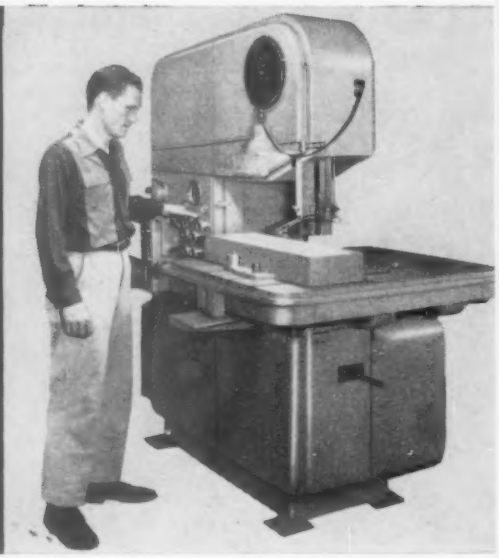
Saw bands for all makes of band machines and cut-off saws, knife bands, "line-grind" bands, file bands, diamond bands now available immediately from any one of the 35 DoALL Sales-Service Stores in the United States, Canada and Mexico. Sold in 100 and 500 ft. lengths or cut and welded bands to fit your machine. Fill your requirements now.

B-13



MACHINING METALS AND MACHINES





CONTOUR MACHINING SAVES METAL BY CUTTING OUT COMPLETE PIECES — these pictures tell a terrific story. Here are two identical shapes cut from identical stock. Ordinary machining reduces it to a pile of chips. Contour machining saves the slug of metal for other use.

DoALL CONTOUR-MATIC FREES $35,000 MILLING MACHINE FOR OTHER WORK — rough cutting of aluminum forgings on DoALL Contour-matic — a machine that represents only about 1/6 of the capital investment in milling machines formerly tied up on this operation.

THERE IS a place for DoALL *Band Machining* in every industry for production or maintenance work. It is one of the significant developments in the machining of metals or the cutting of any material:

Cuts Continuously — the endless band slices through the material, cutting all the time, all the way, leaving only a thin slot in its wake. It's the world's fastest method of machining the greatest variety of materials to shape.

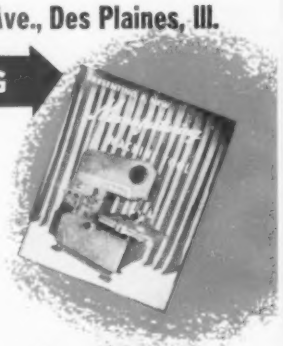
Direct Cutting of Intricate Shapes — it's easy to follow any layout line with the narrow band tools used.

Cuts Any Material — there is a DoALL Band Tool for every sawing, filing, grinding, polishing or friction sawing job on all metals, glass, wood, cloth, leather, rubber, paper, plastics and other materials. Use it to make tools, dies, jigs, parts; to trim, shape, file, polish.

A Machine for Every Purpose and Every Pocketbook — from the inexpensive "Utility" series to the versatile, all-purpose Contour-matic, there is a DoALL Band Machine for you — the most complete line in the world. Ask to have a free DEMONSTRATION made for your people *in your own plant*. Call your local DoALL Sales-Service Store or write:

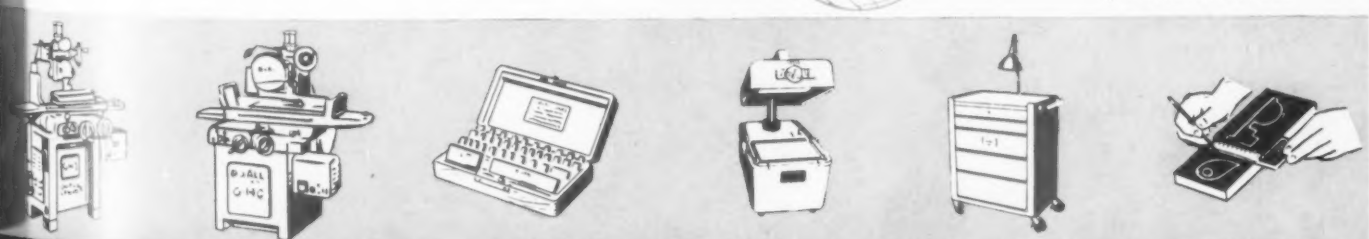
THE DoALL COMPANY, 254 N. Laurel Ave., Des Plaines, Ill.

SEND FOR THIS CATALOG



Learn what DoALL Band Machining can do to save manhours, metals and machines for you — it's a key answer to *more production*.

DoALL *for More Production*



New 24-Page DoALL Catalog Describes Uses of Gages and Accessories; Covers Calibration Service, Mobile Inspection

Just off the press, a new 24-page Gage Block Catalog tells the 10 big reasons why you can trust DoALL Blocks to maintain dimensional quality control in your manufacturing, explains why gage blocks are necessary and how their many uses make them so valuable in providing precision dimensional control for all plants regardless of size.

Fully illustrated, the catalog describes all DoALL Block sets, from 6 to 118 pieces, both English and Metric, and explains their use for checking tools, parts and other gages.

New Monolite Illustrated

Gaging Accessories such as holders, scribers and sine bars, are described and pictured in actual use. Also included is a description of the new DoALL Monolite and optical flats used to read millionths-of-an-inch variation in size and surface with light interference bands. The accompanying illustration compares the new DoALL Monolite with the previous model. The new unit is a direct result of DoALL's continuous pioneering in development of equipment for measurement with light waves.

The DoALL four range electric Comparator Gage is described as are precision granite surface plates.

Reading left to right: New DoALL Block 24-page catalog; 83-piece DoALL Block set; the new larger, higher intensity DoALL Monolite alongside the previous model.

Mobile Inspection Discussed

The new catalog explains briefly how the DoALL Mobile Inspection Unit, used to check shop gages at the point of work, can save manhours and money and reduce rejects.

Other points discussed include DoALL Calibration Service for all makes of gage blocks, availability of DoALL technical literature and DoALL demonstration service. Copies of the Catalog may be secured from any of the Sales-Service Stores listed below.

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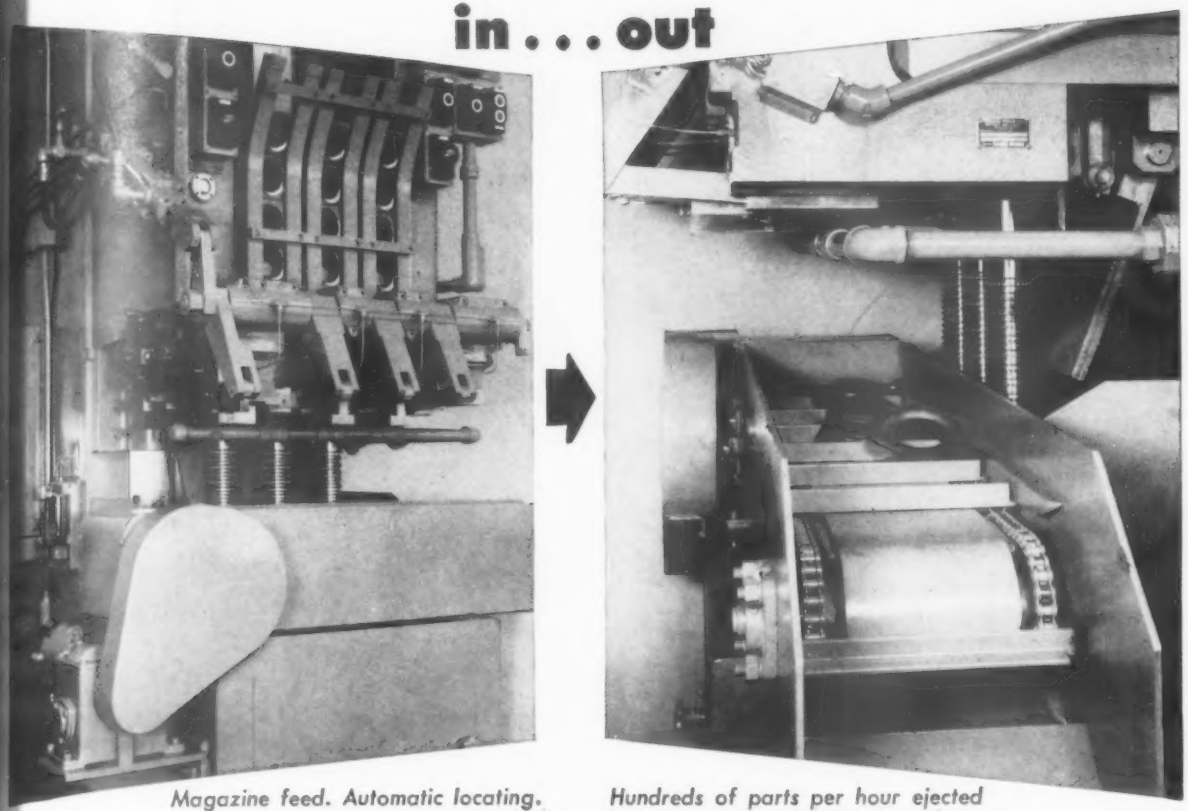

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55 PAGES OF FACTS ON HOW TO CUT YOUR SMALL PARTS FINISHING COSTS

Now you can get up-to-the-minute news on the very latest developments in barrel-finishing — the fast, modern, economical process that deburrs, removes scale, tool marks and flash, and produces surface finishes and radii to blueprint specifications.

Norton Company's brand new booklet covers the subject thoroughly in 55 liberally illustrated, fact-filled pages — describes in detail every phase of barrel-finishing — tells you what to do, *and what not to do*, for best results.

PARTIAL LIST OF SUBJECTS

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GET THIS MONEY-SAVING INFORMATION

The new booklet also tells you how Norton ALUNDUM* tumbling abrasive — especially developed to meet industry's wartime needs for fast, efficient small parts finishing — has become a standard barrel-finishing medium in plants throughout the country.

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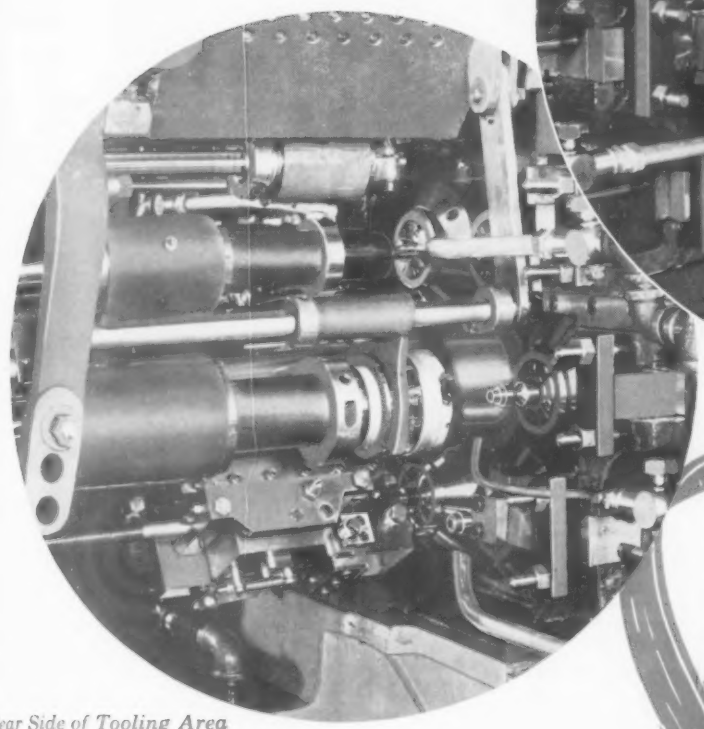
Making better products to make other products better

M RE IN ONE BASKET

Front Side of Tooling Area



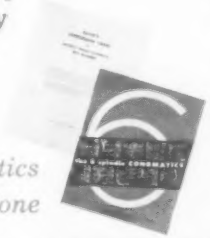
Rear Side of Tooling Area

The "automatic" has substantiated many of the advantages of centralized responsibility in metal turning.

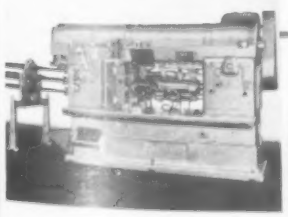
Even the earlier users realized that more work pieces can be profitably placed in one basket *if nothing upsets the basket.* Dependable performance has always been vital to the successful use of the "automatic".

The factors that determine the degree of dependability of an "automatic" are a very important part of its specifications. They are a part of the *complete* information available on CONOMATICS.

In producing the above part on a 1¾"-SIX, the cycle time of 14 seconds per piece is not as important as the total time necessary for the entire run. Dependable performance pays.



A Comparison of ALL Automatics is in Favor of Cone



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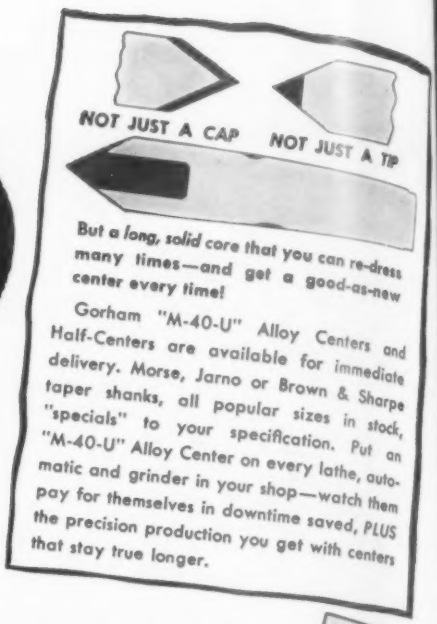

But a *long, solid* core that you can re-dress many times—and get a good-as-new center every time!

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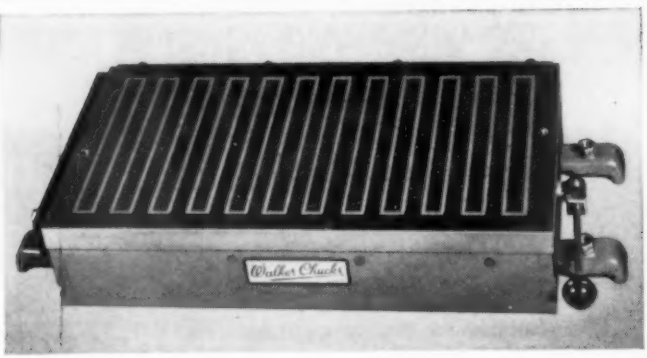

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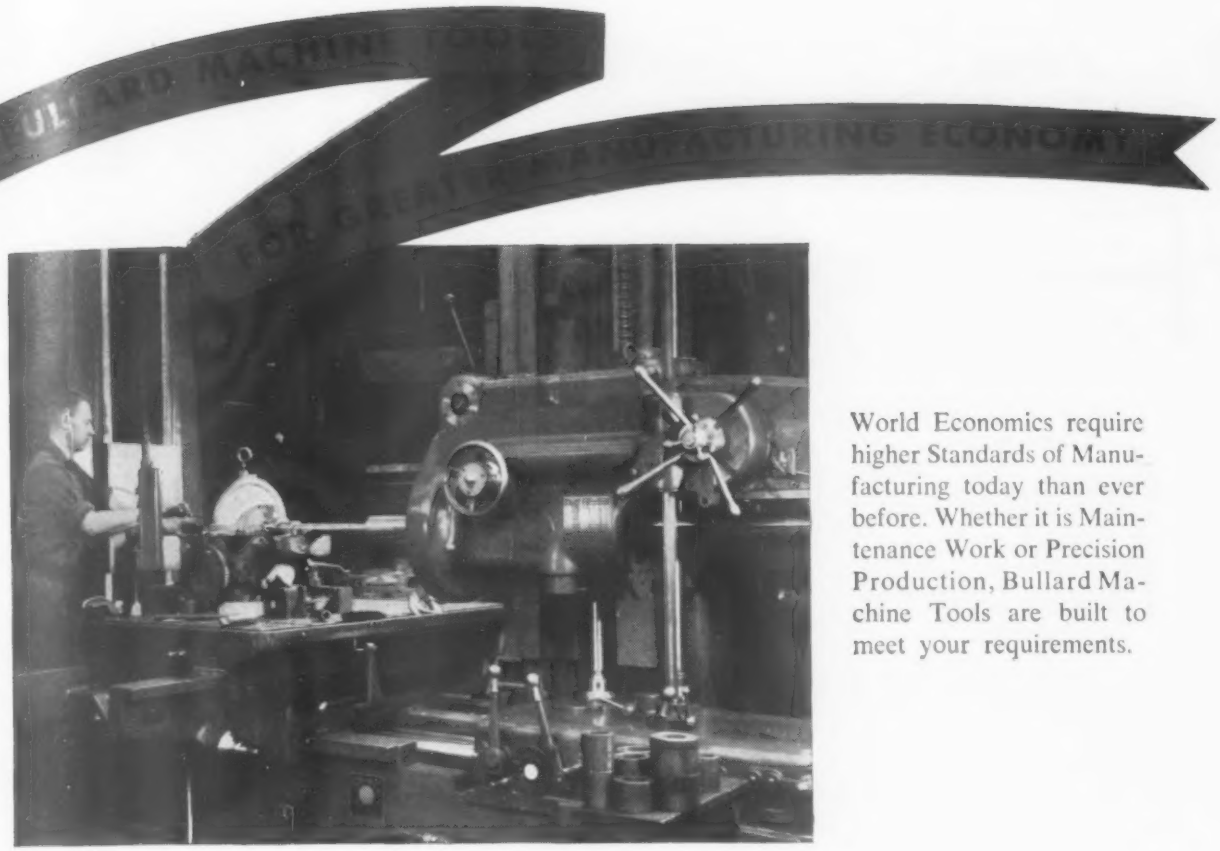

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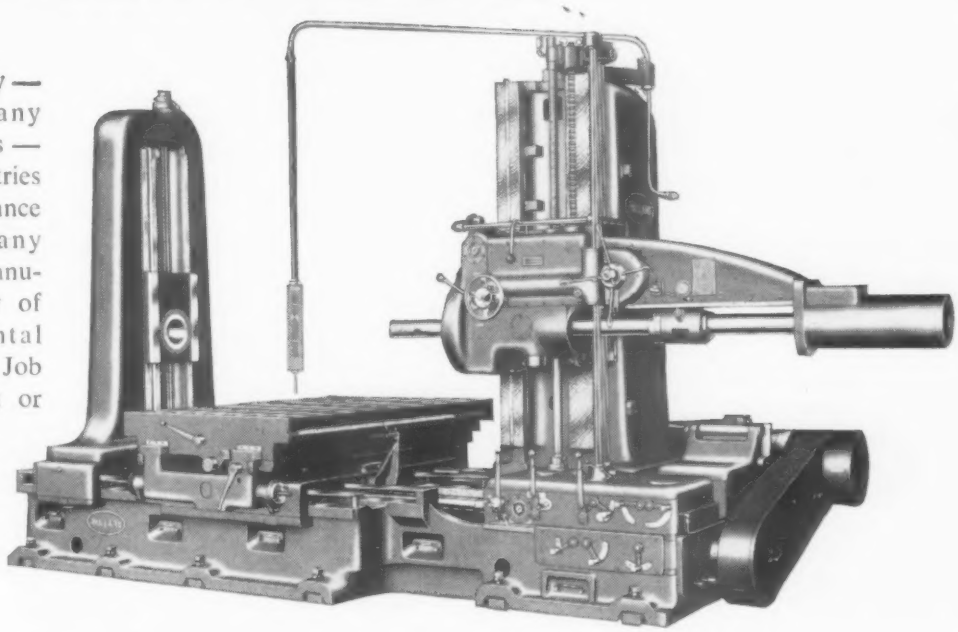

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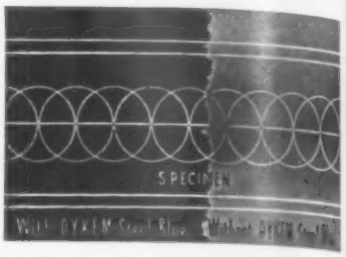

Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout show up in sharp relief and at the same time prevents metal glare. Increases efficiency and accuracy.

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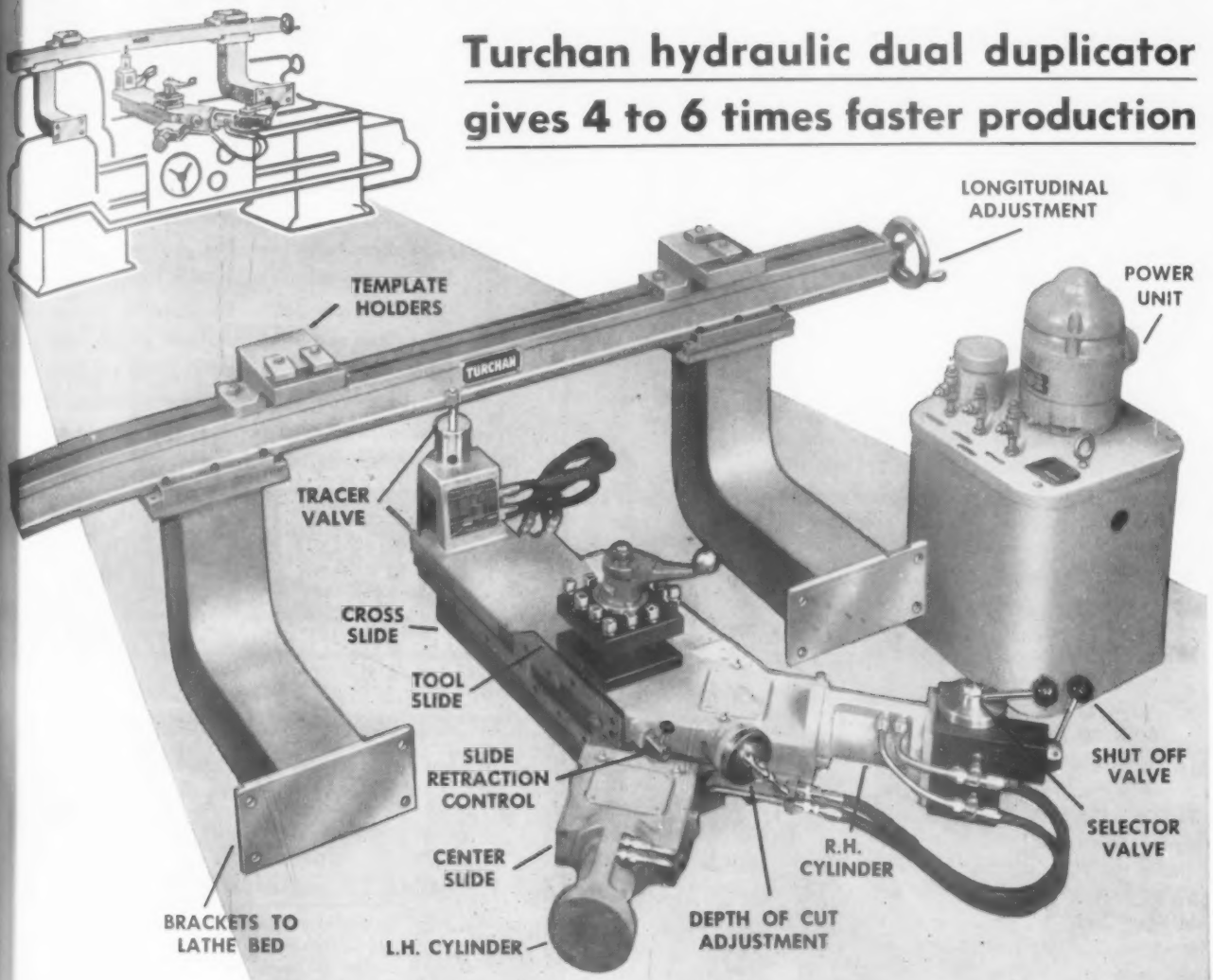
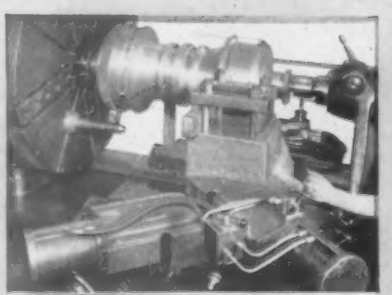
Greatest advance in turning since the invention of the metal working lathe!

Turchan hydraulic dual duplicator gives 4 to 6 times faster production



Just add this Turchan dual-turning hydraulic duplicator to your standard lathes and watch costs go down! No more need for expensive special form tools. No skilled help required. Job set-up time is cut to a small fraction of old way. A cross slide equipped with two compounds at 45° to center line and 90° to each other replaces the conventional arrangement, allowing a new combination of movements. The 45° compound movements are controlled through a tracer, guided by template or full size model, while the cross and longitudinal travels are obtained with the regular lead screws.

This DOUBLES tool approach to the work, greatly extending use of the machine tool. Only one slide at a time is controlled by the tracer. Machining of right or left square shoulders, bevels, tapers, steps, undercuts, radii and contour facing is easily accomplished. All this at faster speeds, and greater accuracies (to .001".) Size of work is limited only to capacity of the lathe. There are other Turchan Follower attachments for milling machines, planers, shapers and grinders. "Turn to Turchan to cut costs." Send for our latest folder.



This large form mould on a 60-inch lathe was turned 4 times faster by Turchan dual control than by former method. A tough job made simple!

WRITE US TODAY: Send a sketch and specifications of any job. Give make of machine. We'll show you how to produce it better, faster, at lower cost.

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But **WAUKESHA** also has unusual facilities for the manufacture of special tools to meet your individual problems. **WAUKESHA** Engineers will welcome an opportunity to cooperate.

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The XPEDITOR is the latest development in portable, high speed abrasive belt grinders. Instantly adjustable to any angle to give operators full view and control . . . swivels 360°. Equipped to do line contact, free belt and precision platen grinding and contour polishing. Speeds deburring and clean-up jobs; also used with jigs or fixtures or automatic feeding as a production unit . . . guaranteed to increase productivity. XPEDITOR (less motor) $59.50. Write

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Talide
(TUNGSTEN CARBIDE)
MEETS EVERY REQUIREMENT

For the past twenty-five years actual operating records have proven the advantages of Talide tools, dies, blades, bushings, rolls and other tungsten carbide products.

On most cutting, drawing, rolling and wear-resistant applications, you can triple your production and cut costs in half. Extra long runs make Talide Metal less expensive than steel.

Send us parts or prints and we will show you how this hardest man-made metal can help you secure more production from your present equipment. Write for Catalog 50-G or ask for a Talide sales engineer to call.

METAL CARBIDES CORPORATION
YOUNGSTOWN 7, OHIO
SINTERED CARBIDES—HOT PRESSED CARBIDES

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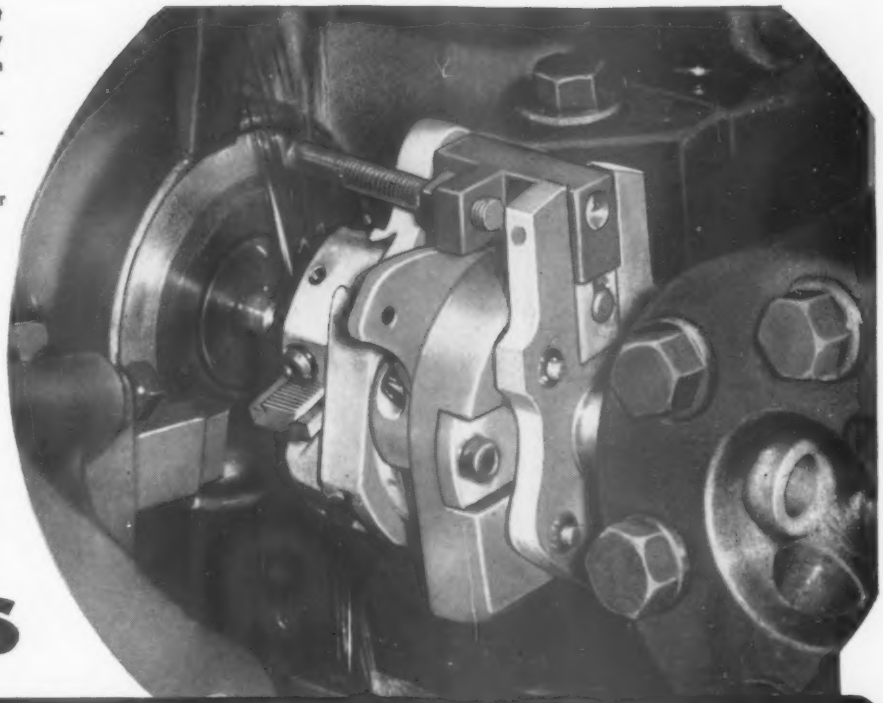
- Simple, compact design combines light weight with strength, to function dependably and accurately at high indexing speeds, with long runs between grinds.
- All important bearing surfaces are hardened and ground and hand lapped.
- All external surfaces are chrome plated for protection.



JONES & LAMSON
AUTOMATIC OPENING
DIE HEADS

for Brown & Sharpe Automatics and Small Turret Lathe Applications

Designed and built for high production quality threading, these new J&L dies perform with smooth, easy action, unusual repetitive accuracy, and year 'round dependability at low cost. They will give you maximum productive machine hours each day.

No. 16-S is for use on No. 00 and 00G and No. 0 and 0G Brown & Sharpe Automatics and small turret lathes. It uses long wearing ground thread, radial type chasers *with two cutting edges*. These DUALIFE chasers are easily and quickly removed and replaced in their holders. When one edge wears out, just turn them over, and you have the equivalent of a new set of chasers. Minimum down time and maximum production result.

No. 18-S and 19-S Model 18-S is for use on No. 0, 0G and No. 2, 2G Brown & Sharpe Automatics. Model No. 19-S with wider capacity range, is for use on No. 2, 2G Brown & Sharpe machines. Both are also used on small turret lathes. They have Tangent type chasers, ground all over, incorporating the exact helix angle and thread form. They are easily removed and replaced without disturbing the head and holder assembly. Many of these chasers are interchangeable between the two models and other standard J & L Tangent Die Heads. Carbide chasers can be used when conditions permit.

WRITE DEPT. 710 FOR TANGENT AND RADIAL DIE CATALOGS

JONES & LAMSON

Machine Tool Craftsmen Since 1835

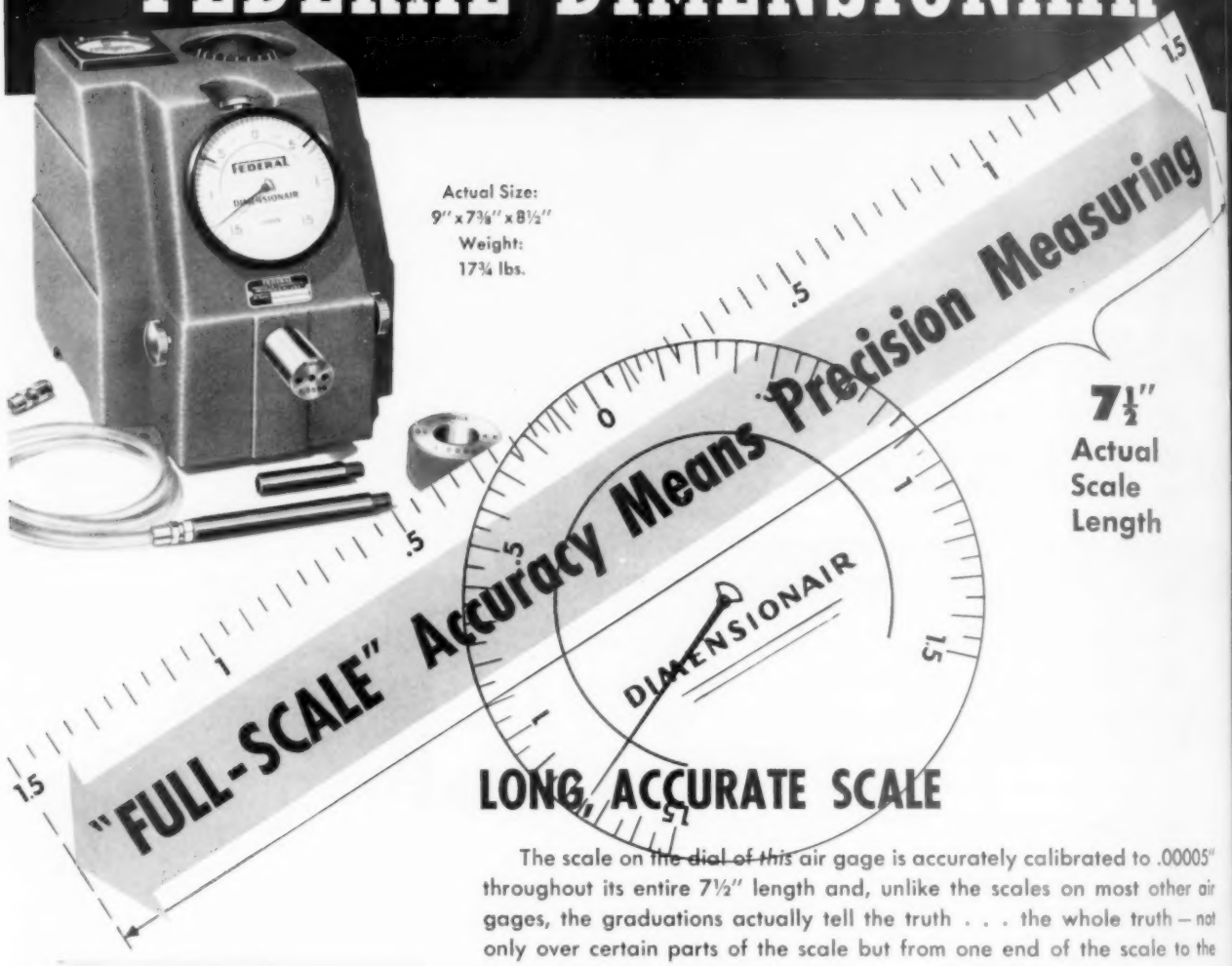
JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

J&L® DIE HEAD DIVISION

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-133

FEDERAL DIMENSIONAIR

Actual Size:
9" x 7⅜" x 8½"
Weight:
17¾ lbs.



LONG, ACCURATE SCALE

The scale on ~~the dial of *this*~~ air gage is accurately calibrated to .00005" throughout its entire 7½" length and, unlike the scales on most other air gages, the graduations actually tell the truth . . . the whole truth – not only over certain parts of the scale but from one end of the scale to the other. With the Federal Dimensionair you can rely on the accuracy of readings *anywhere* on the scale and work to close limits within a wide tolerance zone.

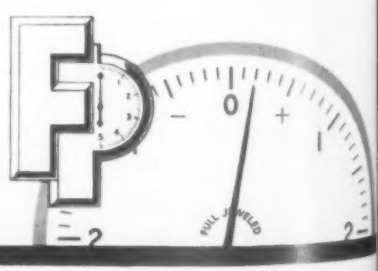
The Federal Dimensionair has many other important features: The long operating range of .003" with 2500 to 1 magnification provides clearance for exploring irregularly shaped or tapered holes and permits the *same* plug to be used on *both* rough and finished dimension. This clearance also means longer plug wear. The Dimensionair is easily set with only one master due to the accuracy of our scale and it remains stable for long periods.

Ask our nearest representative to show you this air gage which sets new standards in better, more positive air gaging, or write to us for complete information and prices. Federal Products Corporation, 1192 Eddy Street, Providence 1, Rhode Island.

A Triple Gage set up with remote regulator control. Any number may be used according to number of dimensions to be gaged simultaneously.

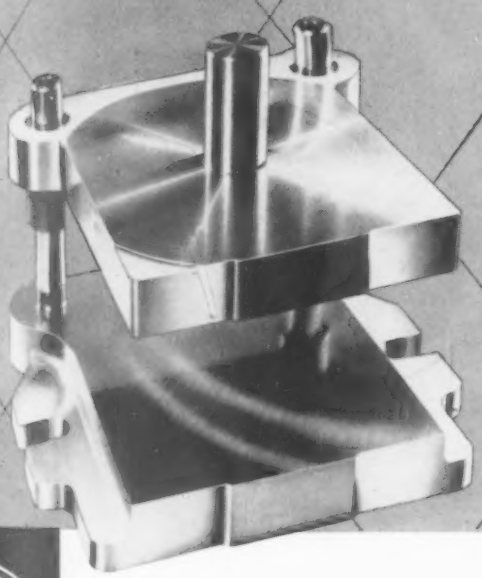
FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing *all types* of DIMENSIONAL INDICATING GAGES



Faster!

Save Tooling Time



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PRECISION DIE SETS

SEND FOR YOUR FREE COPY OF THIS NEW BOOKLET TODAY!

You save time when you "tool up" with Danly Die Sets . . . preferred by diemakers everywhere. Check the unique precision features that mean faster die completion and longer production runs . . . see how the nationwide system of Danly assembly branches reduces costly delivery delays. Write for your copy now . . . Danly Die Sets are certain to help you meet production schedules.

DANLY®

DANLY MACHINE SPECIALTIES, INC. 2100 South Laramie Avenue, Chicago 50, Illinois

PARKER • MAJESTIC pm **PRECISION MACHINES**

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PARKER-MAJESTIC, INC.

For over twenty-one years this company has manufactured the Parker Spindles used in Precision Grinding, Boring and Milling applications.

Supplementary products include the well known line of Parker-Majestic Internal, External, No. 2 Surface and Rotary Surface Grinders.

Descriptive literature upon request.

PARKER-MAJESTIC, INC.

formerly **MAJESTIC TOOL & MFG. CO.**

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BASIC FOR EVERY TOOLROOM

the LINDBERG TOOLROOM TEAM

When production depends on tools and dies, tools and dies depend on the LINDBERG TOOLROOM TEAM—a basic requirement in every toolroom—a must where you want the ultimate in tools and dies which will keep your production rate up and your machinery running with a minimum of tool and die failure. The LINDBERG TOOLROOM TEAM gives you the precision heat treating which your precision tools and dies need for lasting performance.

LINDBERG HARDENING FURNACE—eliminates finishing due to scale and decarb with simple accurate atmosphere control.

LINDBERG TEMPERING FURNACE—allows you to obtain the exact "Rockwell Hardness" required for each specific tool or die.

For tools and dies requiring high speed tool steel—investigate the Lindberg "L" Type combination preheat—high heat Furnace.

LINDBERG FURNACES

LINDBERG ENGINEERING COMPANY, 2466 W. Hubbard Street, Chicago 12, Illinois

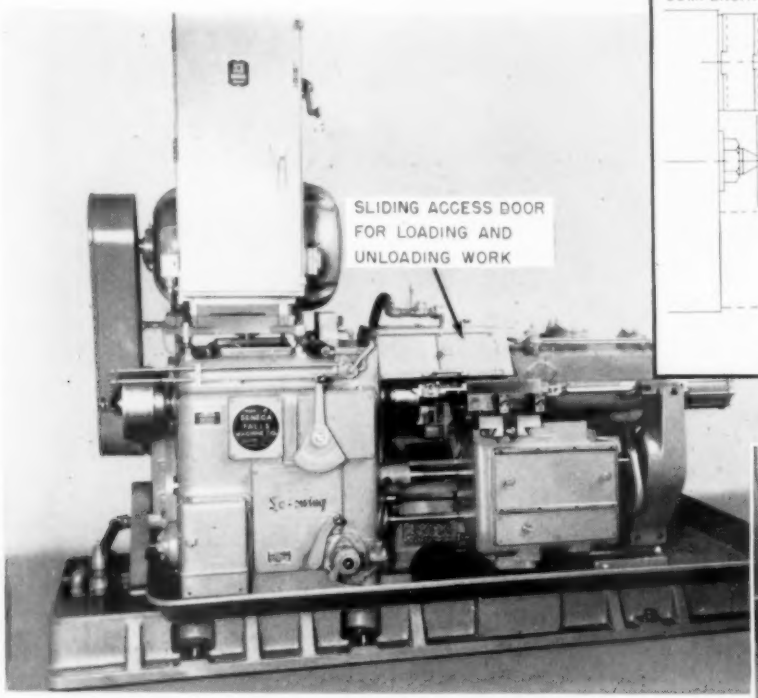
Specify LINDBERG

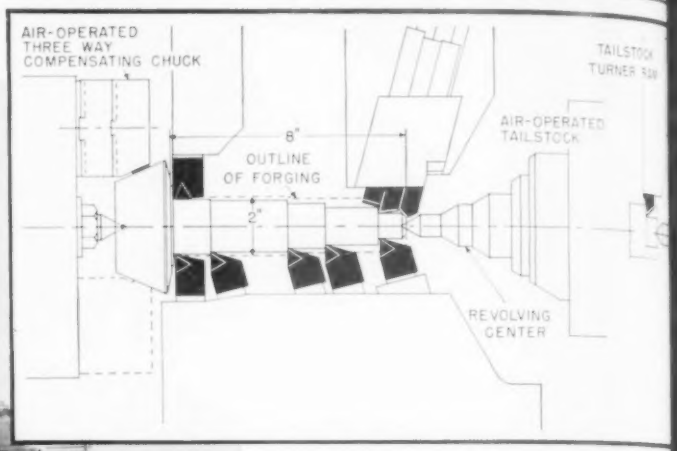
for any heat treating or melting need!

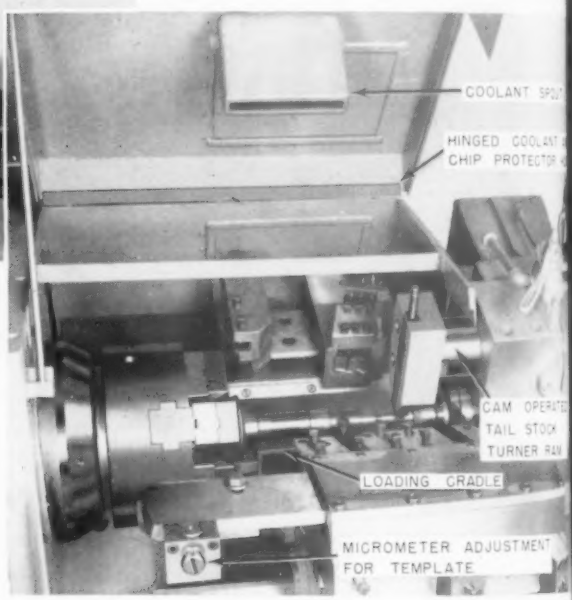
Lindberg manufactures every type and many sizes of melting and heat treating furnaces from tiny laboratory units to mammoth field erected installations—whether it's gas, oil, electric, arc, low or high frequency. When planning your heat treating or melting installation, consult your local Lindberg Office!

MACHINE OF THE MONT

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW Y







MODEL "AR" AUTOMATIC Lo-swing LATHE TURNS REAR AXLE PINION AT FAST PACE

Problem: Turn and face all stem diameters of Axle Pinion simultaneously, taking two cuts over the threaded diameter to remove large amount of surplus material.

Solution: The Model AR Lo-swing Lathe selected for this job was equipped with a cam-operated auxiliary turning ram mounted on the tail-stock casting and fitted with a carbide tool for removing surplus material ahead of a front carriage turning tool which does the sizing. The broken line on the drawing shows the actual shape of the forging and the large amount of surplus material at the threaded end. This drawing also shows the disposition of the tooling for turning and facing all diameters. All tools are tungsten carbide cutting at high surface speeds.

The machines supplied for this job were equipped with heavy chip guards to protect the operator from flying chips and coolant. Upper illustration shows the front sliding door thru which work is loaded and unloaded. Lower illustration shows the entire hinged hood in an upright position to facilitate tool changes and adj ments. Note that the coolant spout is attached to moves with the hood. This view also shows the operated tailstock turner ram and the loading cr for the parts.

In operation, the operator simply opens the sli door, places a rough forging in the loading cradle closes the door. The air operated tailstock ce pushes the part into position on the headstock ce the chuck jaws clamp the piece and the machi then started. A safety devise prevents starting o machine spindle before the chuck jaws are clo thereby preventing damage to the cutting tools other equipment.

Seneca Falls engineering staff is at your dispos help solve your turning problems.

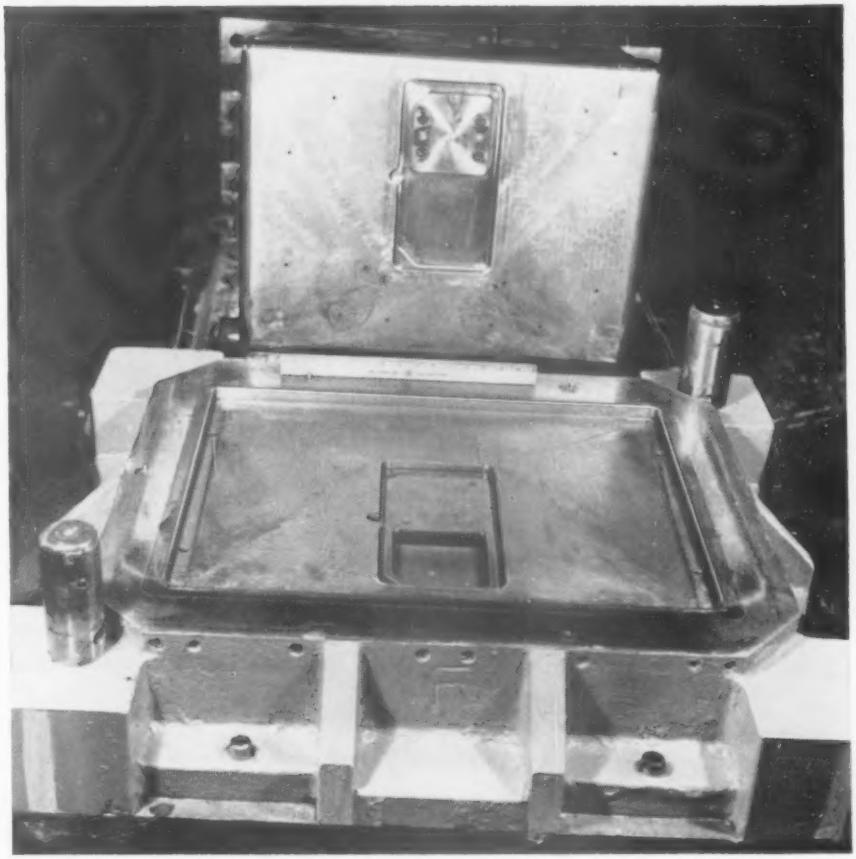
SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

45,000 score-free parts...after switching to GRAPH-MO steel dies!

THE Clark Grave Vault Company, Columbus, Ohio, ran into trouble in making sheet steel top panels for home appliances. Parts were coming off the dies badly scored. Expensive hand finishing operations were necessary. And production was very low due to pickup and galling on the dies. Obviously, the ordinary tool steel used in the dies wasn't doing the job.

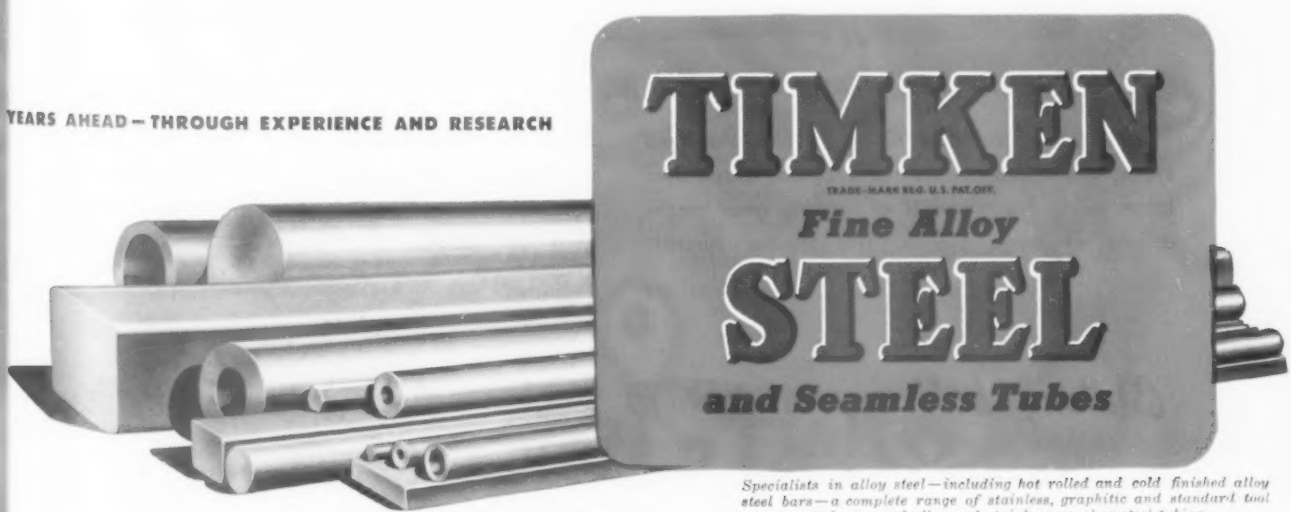
Engineers at The Clark Grave Vault Company started a search for a tool steel to replace the one they were using. They found the answer in Graph-Mo—one of four Timken® graphitic tool steels. When The Clark Grave Vault Company switched to Graph-Mo dies, pickup, galling and scoring were entirely eliminated. More than 45,000 pieces have been made on these dies and the dies are still turning out score-free panels.



Because of free graphite and diamond-hard carbides in its structure, Graph-Mo has outstanding low-friction properties—minimum tendency to scuff, seize, score or gall. Graph-Mo offers other advantages for dies, too. The free graphite makes machining to close tolerances quick and easy. The carbides in Graph-Mo offer unusually stubborn resistance to wear and abrasion. And Graph-Mo hardens uniformly with minimum distortion, gives a fine finish after polishing.

Timken graphitic tool steels are widely used in dies, gauges, machine parts and other applications. For further information, write for the enlarged 10th edition of the Timken Graphitic Steel Data Book. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

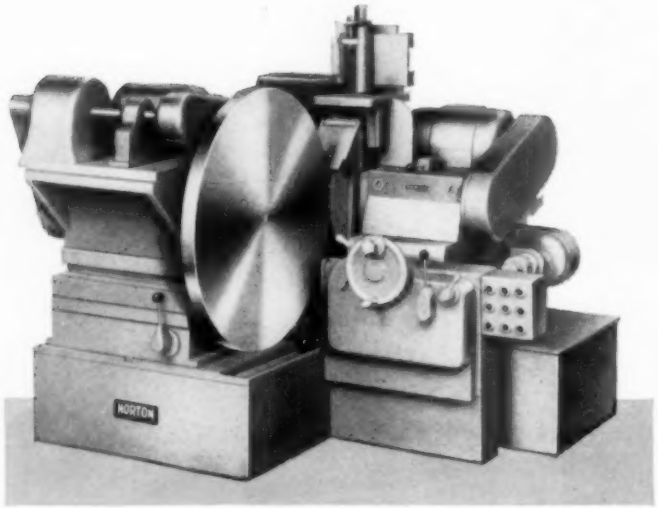
YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.

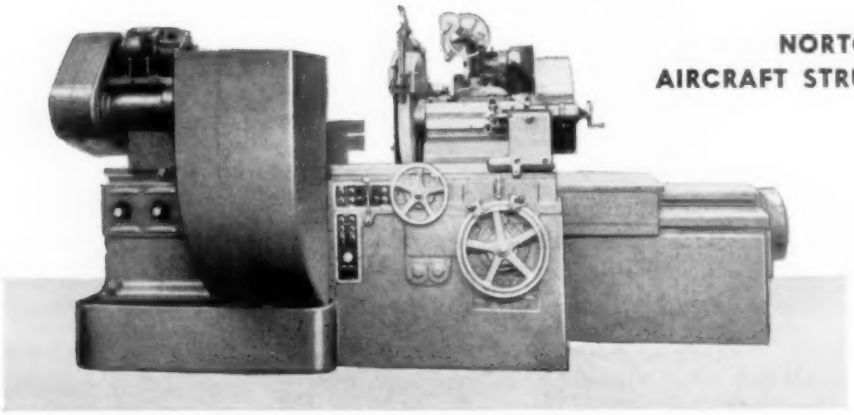
NORTON

SPECIAL AIRCRAFT PRODUCTION GRINDERS



NORTON
SPECIAL 42" COMPRESSOR
WHEEL GRINDER

The Norton Special 42" Compressor Wheel Grinder both simplifies and speeds up O.D. grinding operations on compressor wheels. Designed for exceptional ease in loading and for simplified control this machine also provides the operator with maximum visibility of the actual grinding operation. Sturdy Norton wheel spindle unit and wheel feeding mechanism assure extremely precise grinding even at maximum production.



NORTON
AIRCRAFT STRUT GRINDER

The Norton Aircraft Strut Grinder, unlike standard types, can accommodate the irregular shape and large swing requirements of landing gear mechanisms of large planes. This special Aircraft Production Grinder, too, is designed to simplify loading, operating and maintenance—an ideal machine for grinding components of landing gear mechanisms.

Making better products to make other products better

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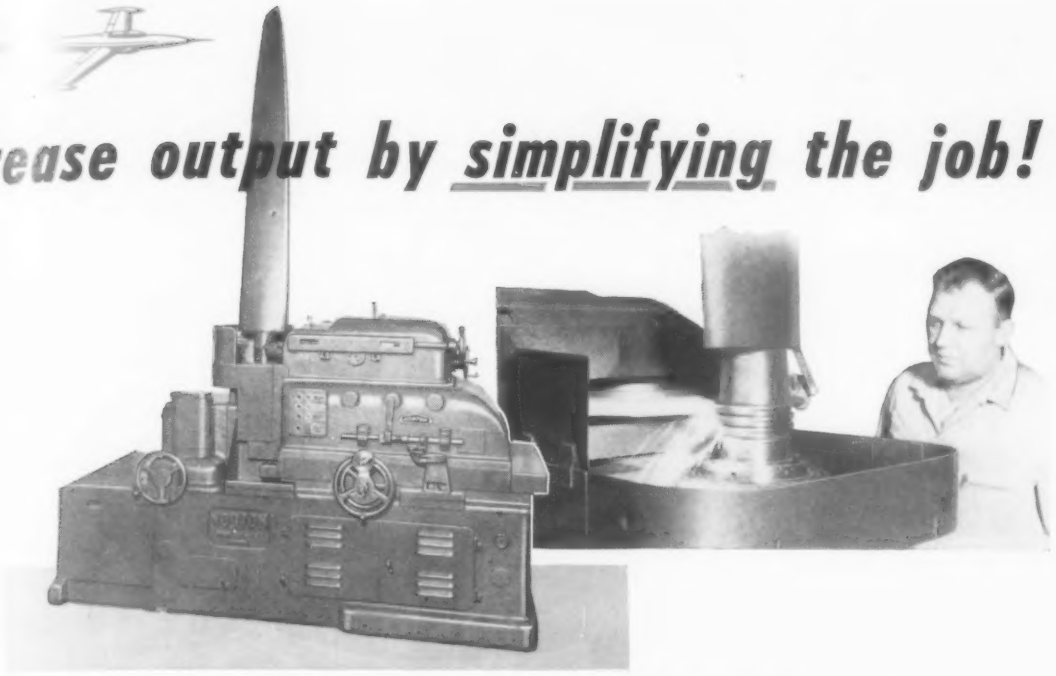
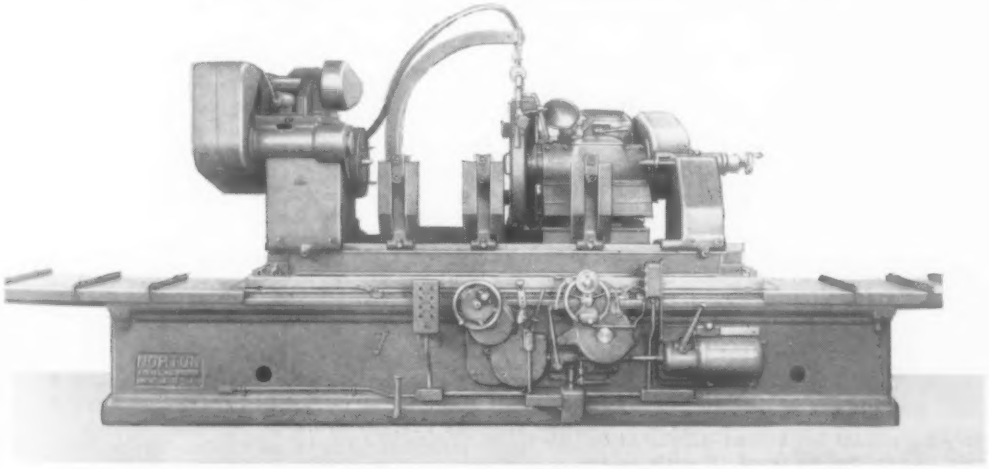
DISTRICT SALES OFFICES: HARTFORD • NEW YORK • CLEVELAND • CHICAGO • DETROIT

Increase output by simplifying the job!



NORTON PROPELLER BLADE HUB GRINDER

The Norton Propeller Blade Hub Grinder grinds the external surfaces of blade hubs including ball races with maximum efficiency by holding the blade in a vertical position. This eliminates possible errors due to deflection characteristics of the blade when held horizontally. Likewise, this vertical arrangement simplifies and speeds up both loading and clamping.



NORTON 42" x 72" SPECIAL UNIVERSAL JET PART GRINDER

The Norton 42" x 72" Special Universal Jet Part Grinder is a heavy production grinder equipped with all universal features necessary for simplification of jet engine component grinding. The massive proportions of the machine assure extreme precision and stability under heaviest production demands. Its heavy production type wheel slide takes a 30" diameter grinding wheel and swivels 180° by power, thus permitting rapid angular settings of the wheel to meet the varied requirements of grinding jet parts.

To Economize Modernize with NEW

NORTON

GRINDERS and LAPPERS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-141

REPLACE CARBIDE TOOL TIPS QUICKLY AT LOW COST

NEW TIP-BRAZING UNIT IDEAL FOR METAL WORKING SHOPS

Now — a safe, easy, economical way to braze carbide tool tips on tool shanks. This new tip-brazing unit is a low-cost investment for any shop and will soon pay for itself. Many already in use with proven successful results.

REQUIRES MINIMUM TIME

Tips are removed and replaced on 1½" by 1" tools in as little as 2½ minutes over-all. All elements are adjustable.

ECONOMICAL TO OPERATE

Uses 75 lbs. compressed air in combination with manufactured or natural gas at regular city pressure. No expensive electrical controls required. No complicated equipment to service or maintain.

GREATER ACCURACY

Refractory-cup radiant gas burners, supported by adjustable clamps, can be faced to within ¼ to ½ inch of tool shank.

SAFE, FOOLPROOF METHOD

No "blasting" over the tool because velocity of burning gases is largely dissipated within burner cup. No danger of flux being blown off at tool end before brazing is completed. Less inclination toward oxidation than other methods.

ATTRACTIVE — RUGGED — COMPACT

Modern, streamlined appearance. Requires only five feet of floor space. Sturdy construction to provide long, constant use.

EASY TO OPERATE

Few moving parts and simple operation make it easy for any workman to do the job without special training. Tool tips are easy to get at.

VERSATILE

Unit also ideal for annealing welding tools and heat treatment of small parts. A small oven can easily be adapted to the unit. Higher temperature bronze bond can be used rather than silver solder.

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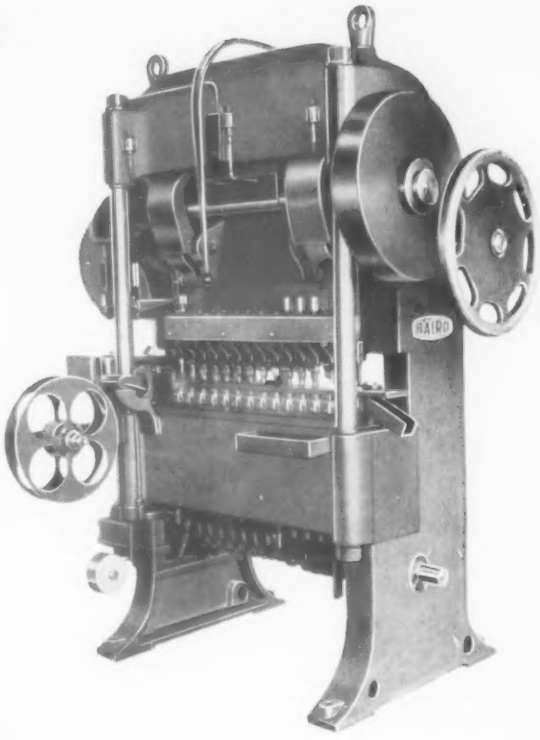
HIGH PRODUCTION TOOLING

Is low-cost volume production of SMALL PARTS one of your problems?



Then let us tool the job for you on a

BAIRD MULTIPLE TRANSFER PRESS...

and you can just about push the "start" button and forget it. Coiled stock is automatically fed to the press, moving quickly from station to station for blanking, drawing, piercing, embossing, slitting, trimming, broaching, sizing, hexing, forming, etc.

Here, for example, is a typical job (photograph shows work as performed in a 14-station die set).

HEX LOCK NUT COMPLETED IN ONE OPERATION

It starts with the round blank No. 1 and continues through the drawing operation to station No. 9. At station No. 10 the flange is trimmed to size for Hexing. Station No. 11 — the two sides are pierced. No. 12 is sizing. No. 13 — the Hexing is done. No. 14 — the end hole is pierced and the piece is completed. Figure "A" is a piece cut in two to show the section. "B" are completed pieces. The production is 70 pieces per minute.

For low-cost, automatic production, "Ask Baird about it." Send for Transfer Press Bulletin.

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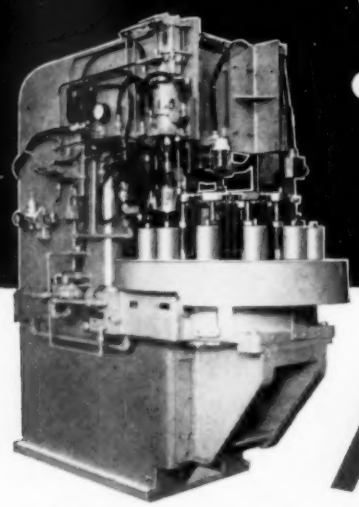
WHAT'S YOUR PROBLEM on Ordnance Production?



MULTIPRESS®

has offered the quick solution for others – *FASTER, BETTER and at LESS COST!*

The fast, flexible, oil-hydraulic *power-control* of Multipress makes it quickly adaptable to the widest range of ordnance work —as typified by the list at right. Built in eight basic frame sizes, in capacities of 1 to 50 ton, and with choice of ram control—*plus design that lends to tooling of widest variety*—Multipress can be delivered and on your production line in the shortest possible time. Doing the job faster, better and at less cost! And it gives you a standard production machine that is always easily reconverted to civilian production at any time. Write today for details on Multipress and our facilities for helping you solve your ordnance production problems.

The DENISON Engineering Co.
1191 Dublin Rd., Columbus 16, Ohio

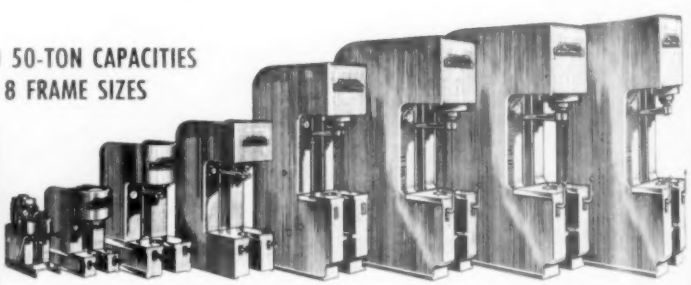
Typical Ordnance Items

PROJECTILES 20 TO 155 MM.	MINES	CARTRIDGE CASES
FIBRE CONTAINERS	BOMBS	PERCUSSION PRIMERS
METAL CONTAINERS	SIGNALS	FUSES
CANVAS BAGS	BURSTER TUBES CASINGS & IGNITORS	ROCKETS

Typical Production Operations performed on this Ordnance Work

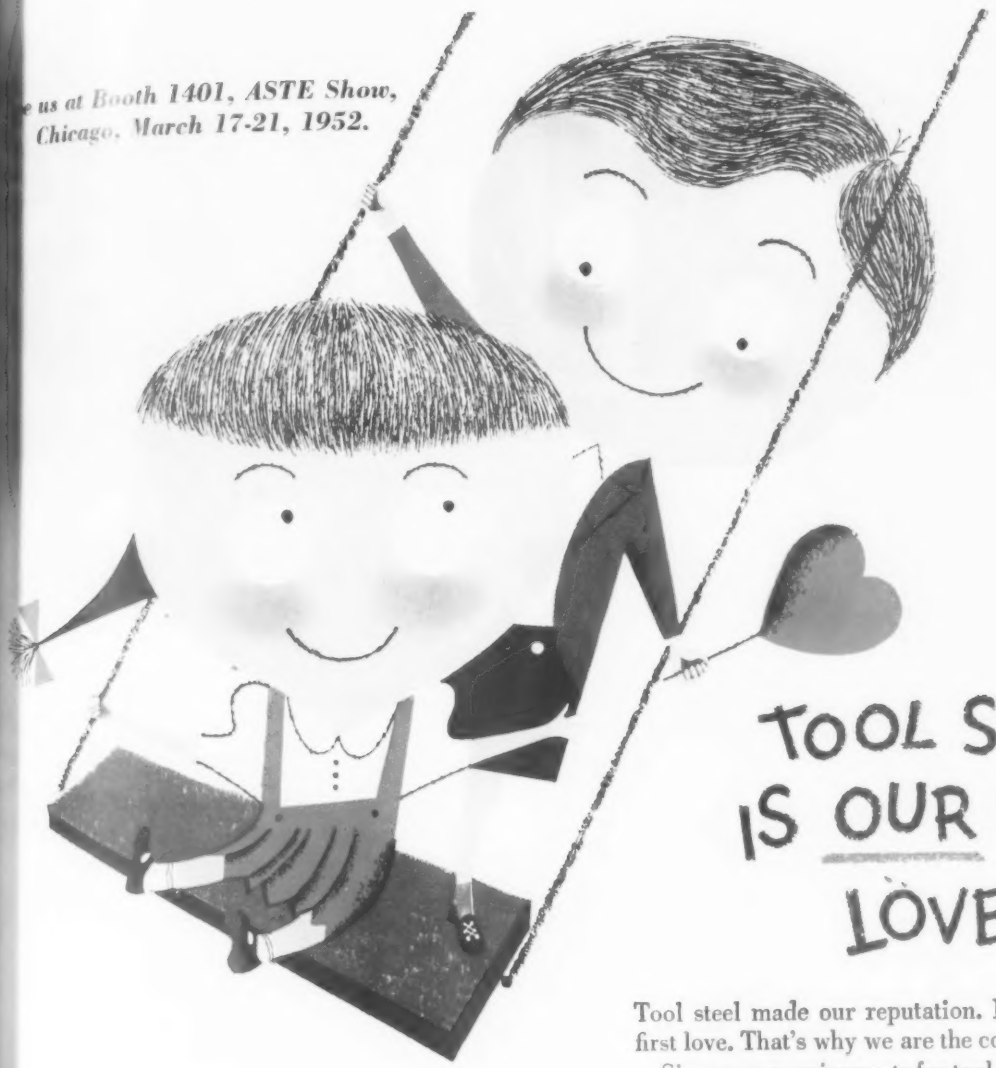
BANDING	SIZING	INSERTING
MARKING	PRESS FIT ASSEMBLY	BLANKING
STAKING	CRIMPING	DRAWING
SWAGING	FORMING	TRIMMING
PIERCING	FLARING	PREFORMING
ASSEMBLY	CLINCHING	TESTING (HYDROSTATIC)
COMPACTION	RIVETING	STAMPING
LOADING	NECKING DOWN	CLAMPING

1 TO 50-TON CAPACITIES
8 FRAME SIZES



DENISON HydrOILics

e us at Booth 1401, ASTE Show, Chicago, March 17-21, 1952.



TOOL STEEL IS OUR FIRST LOVE!

Tool steel made our reputation. Naturally, tool steel is *our* first love. That's why we are the country's top producer.

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52 years of Fine steelmaking

TOOL STEELS

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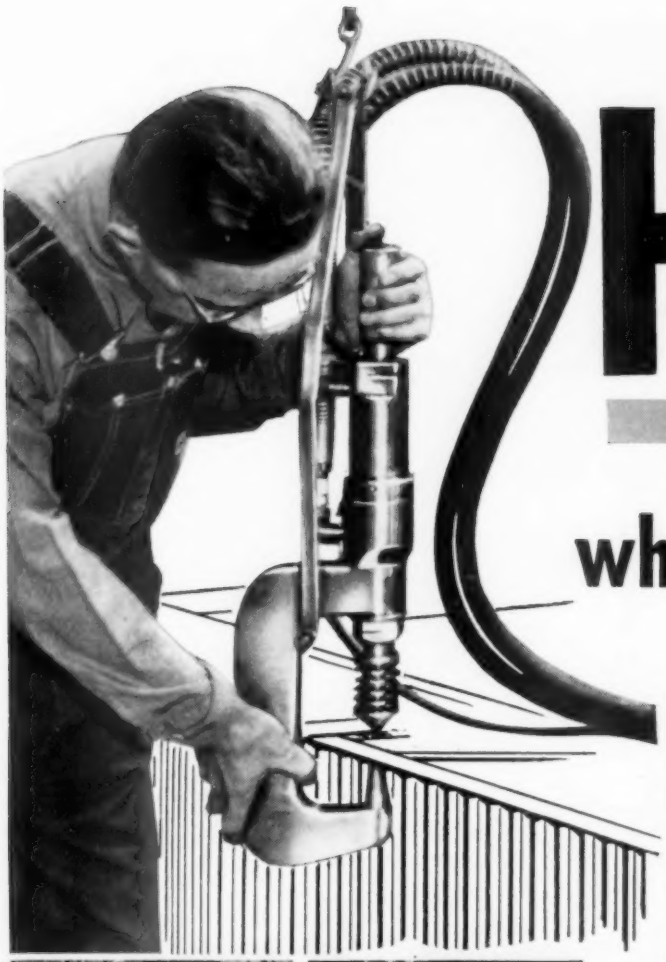

HOLES

where you want them!

Whenever your work involves punching holes in hard-to-get-at or irregularly spaced locations—there's another place where Hannifin "Hy-Power" Hydraulics can help you. This portable equipment with its variety of work tools can bring forces up to 100 tons (more in multiple) to the work as needed.

For instance . . . here a "Hy-Power" punch makes rivet holes on an accurate, easy and fast basis. Then, similar "Hy-Power" work tools take over for riveting. The Hannifin "Hy-Power" riveter cold-sets rivets to stay—quietly, at extremely low cost. This fast, finger-tip controlled operation squeezes each rivet to fill the hole completely . . . forces riveted members tightly together, work hardens the rivets . . . makes strong joints.

But "Hy-Power" Hydraulics are not limited to riveting. The basic high pressure "Hy-Power" generator and portable work tools are widely adapted for punching, forming, bending.

"Hy-Power" *portable punching on furnace radiator shell.*

"Hy-Power" *portable riveting on an assembly operation.*

WHAT IS "HY-POWER"?

The "Hy-Power" generator—heart of the "Hy-Power" Hydraulic System—combines motor, pump, oil reservoir, control valves and high pressure intensifier into a compact, self-contained unit to power production tools.

DESIGN ENGINEERS, TOOL SPECIALISTS

Investigate versatile "Hy-Power" equipment for your plant production operations. Write for "Hy-Power" Hydraulics Bulletin 150. Hannifin Corporation, 1119 S. Kilbourn Ave., Chicago 24, Ill.

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12" LATHE

6300 SERIES

1" Collet Capacity, 1⅜" Bore

A.S.A. L-00 Tapered Key Drive Spindle

HEAVY DUTY PRECISION V-BED

No. 6307 Lathe
No. 7515 Taper Attachment

TIMKEN BEARING EQUIPPED

EVERY feature that makes a precision lathe is incorporated in the Clausing 6300 series. Steel spindle is forged, precision-ground-nose is hardened, ground — turns on selected Timken tapered roller bearings. Headstock gears are steel, run in oil. Dual V-belt drive. Heavy bed combines 2 precision-ground Vee-ways and 2 precision-ground flat ways. Apron is *heavy, double-walled, automatic* — with splash lubrication, positive clutch, steel and cast-iron gears. 8 speeds — 50 to 1300 RPM. Variable drive (optional) provides infinite range of speeds between 30 and 1400 RPM. Quick change ½" steel gears run in oil — instant selection of 48 threads or feeds, from 4 to 224. ⅞" Acme thread lead screw — supported in gear box by two Timken tapered roller bearings. 12¾" swing over bed. 7½" over saddle. 24" – 36" – 48" between centers.

An outstanding lathe, an outstanding value. Catalog sent on request.

Atlas CLAUSING PRECISION MACHINE TOOLS
DIVISION
ATLAS PRESS COMPANY
KALAMAZOO, MICHIGAN U. S. A.

ATLAS PRESS COMPANY

295 No. Pitcher Street
Kalamazoo, Michigan

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Now, Lower Drilling Cost with Fast Flexible

WALKER-TURNER PRODUCTION DRILL PRESSES

Forget, for a moment, the relatively low initial cost of the new Walker-Turner 15" Production Drill Press. Simply consider how the wide range of speeds, the adaptability of drill heads to hundreds of diversified uses, can reduce drilling costs in your shop.

Bear in mind that these machines are Walker-Turner designed. That means *accurate* drilling, which again cuts production costs since it reduces rejects. With 72 different models, more than likely Walker-Turner can provide a low-cost solution to your production problem.

See this new line of Drill Presses at your Walker-Turner Distributor's. Or mail coupon for complete details.

SOLD ONLY THROUGH AUTHORIZED DISTRIBUTORS

General Specifications

SPINDLE TRAVEL: 4¼" or 6".
FOUR SPEEDS: 600, 1250, 2440 and 5000 R.P.M. using a 1740 R.P.M. motor.
CAPACITY: 4¼" travel. Bench Models—12" chuck to table, 17½" chuck to base. Floor Models—39⅝" chuck to table, 46" chuck to base. All models 7½" center of chuck to column. Drills to center of 15" circle.
CHUCK: #6A Jacobs key type capacity 0 to ½" on production models.
TABLE: 10" x 12¼" machined working area.
BASE: 10" x 9" machined working area on Bench Models. 11" x 9" machined working area on Floor Models.
SPINDLE: Six spline full floating type, ⅝" diameter, male #33 Jacobs taper for No. 6A Jacobs Chuck, or #1 Morse taper socket (optional).
PULLEY: Straddle mounted on two ball bearings for extra rigidity. New upper mounting permits quick belt changing.
COLUMN: Ground seamless steel tubing, 2¾" in diameter.

WALKER-TURNER
• DIVISION •
KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

WALKER-TURNER DIVISION
Kearney & Trecker Corp., Dept. T-2, Plainfield, N. J.
Please send complete information on new Walker-Turner Drill Presses.
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DRILL PRESSES RADIAL DRILLS TILTING ARBOR SAWS BELT and DISC SURFACERS METAL-CUTTING BAND SAWS LATHES SPINDLE SHAPERS JOINTERS

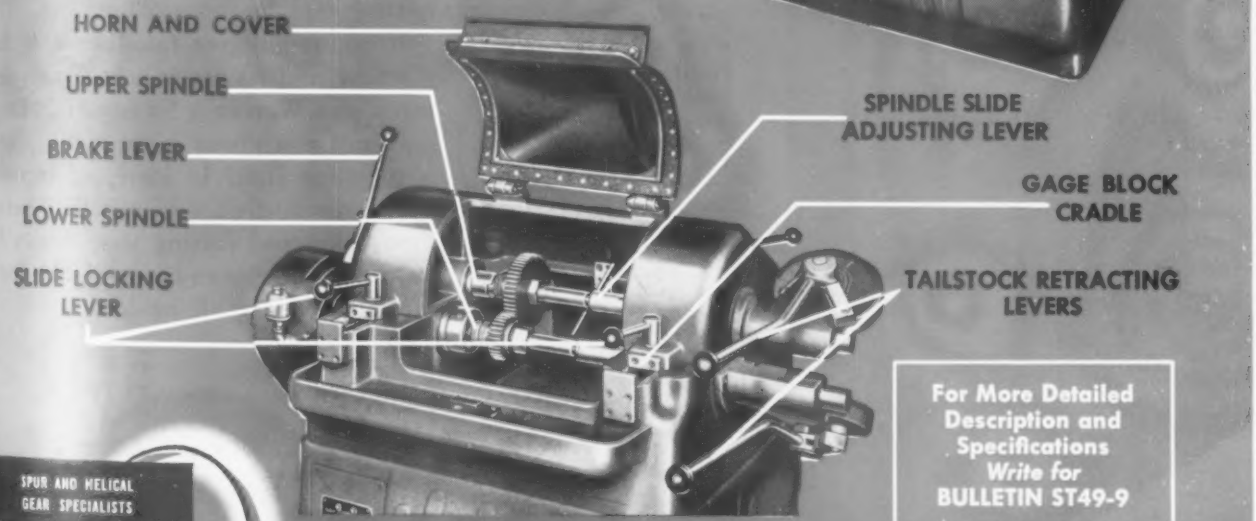
A RED RING SOUND TEST
is the Quickest Way to Screen Out
FAULTY GEARS

When a set of gears runs quietly and smoothly you can OK them for assembly with the assurance they will function properly in service. Such a test under varying speeds can be made easily and quickly by the average shop man.

If the sound test reveals objectionable noise the faulty gears are immediately routed back for correction. You won't waste time and expense by assembling them.

When you have a set of gears in the Sound Tester you can also check tooth bearing. Just use marking compound on one and observe its transfer to the mating gear. When the sound test reveals a nicked tooth the nick may be removed by a pencil grinder while the gear is still in the sound testing machine.

Special sound testing machines are available to meet individual requirements.



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ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

CUTS COST 74% ON CLASS 3 TAPPING JOB!

• *The No. 11 Warner & Swasey Precision Tapping and Threading Machine. Capacity 8-36 to 7/8". Other models from 0-80 to 2½".*

A WARNER & SWASEY Precision Tapping and Threading Machine solved a tough tapping problem for a large New Jersey electrical manufacturer—*and cut cost 74%!*

The job was to tap twenty-four 5/16" 18-pitch Class 3 Threads in large steel rings 48" in diameter. Because a spoiled thread on any of the 24 holes would scrap the job, it was formerly broken into two operations—rough tapping by machine; finish tapping by hand. Tapping cost was high—$23.00 per hundred.

But when a Warner & Swasey No. 11 Precision Tapping and Threading Machine was installed, costs were slashed to $5.95 per hundred! And the job is now done with only one operation.

The continuing accuracy of the exclusive Warner & Swasey lead screw principle using solenoid actuated guide fingers is responsible for the success of the Precision Tapping and Threading Machines on this and hundreds of other tapping and threading jobs calling for Class 3 and 4 fits.

If you're not yet familiar with this machine and its many new design features, let a Warner & Swasey Field Engineer tell you about it. In many plants it pays for itself in increased tap life alone, in addition to effecting better production and cutting scrap losses far below former standards. Write for a catalog covering all models.

WARNER & SWASEY
Cleveland

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

WHEREVER TOOL STEELS ARE APPLIED . . .

Bring this Third Man into the picture

to give tooling and production a new lift!

He brings to your shop a personalized program *expressly developed* to give you more production returns from every hour, dollar and pound of steel you invest in tools and dies!

He brings you practical, *proven* methods that add speed and sureness to the hands of toolmakers and heat treaters. He makes available new ideas to add hours of service life to tools and dies, reduce machine downtime and squeeze *more* from existing plant facilities. He is your Carpenter representative, bringing you Carpenter's personalized service program . . . at no extra cost.

Look what backs his call to your shop: Time-saving data from constant Carpenter laboratory research, issued in regular Service Bulletins. More than 60 years of experience in applying tool steels, made available in Carpenter's Matched Tool and Die Steel Manual. Timely tips on getting more from present heat treating equipment, yours in a new slide chart. Modern, *visual* slide films to refresh skilled men and train apprentices.

Ask *your* friends in the business what Carpenter's personalized program has meant to them. Then, knowing how it can help *you* meet today's critical demands for more output, start now to put it in motion.

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MATCHED TOOL & DIE STEELS

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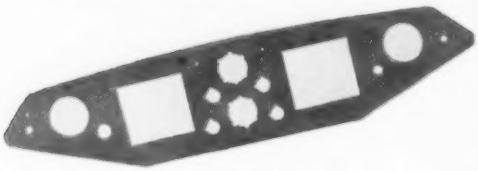

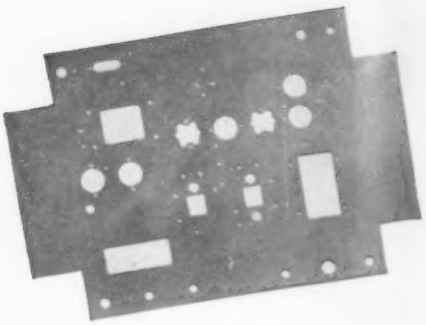

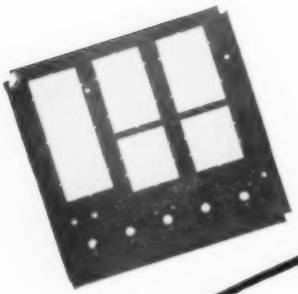

SEE WIEDEMANN

Bulletin 241 describes the most efficient method of producing chassis and similar work in short runs and semi-production runs. Repeat runs of 5 to 1,500 pieces and single runs of 50 to 5,000 pieces are economically produced on the Wiedemann RA-41P. Write today for bulletin 241.

THE WIEDEMANN METHOD permits you to: (1) Keep up with engineering changes without materially affecting production schedule; (2) Keep tool inventory low; (3) Produce quantities in accordance with sales requirements; (4) Produce accurate work with inexpensive tools.

"THE WIEDEMANN METHOD" through the elimination of expensive punch and die set-up and work location methods, provides an efficient means of piercing single pieces, and semi-production runs, regardless of repeat frequency.

Machines available for piercing sheet and plate up to ½" thick, up to 120" wide x 200" long.

Wiedemann
TURRET PUNCH PRESSES

WIEDEMANN MACHINE COMPANY

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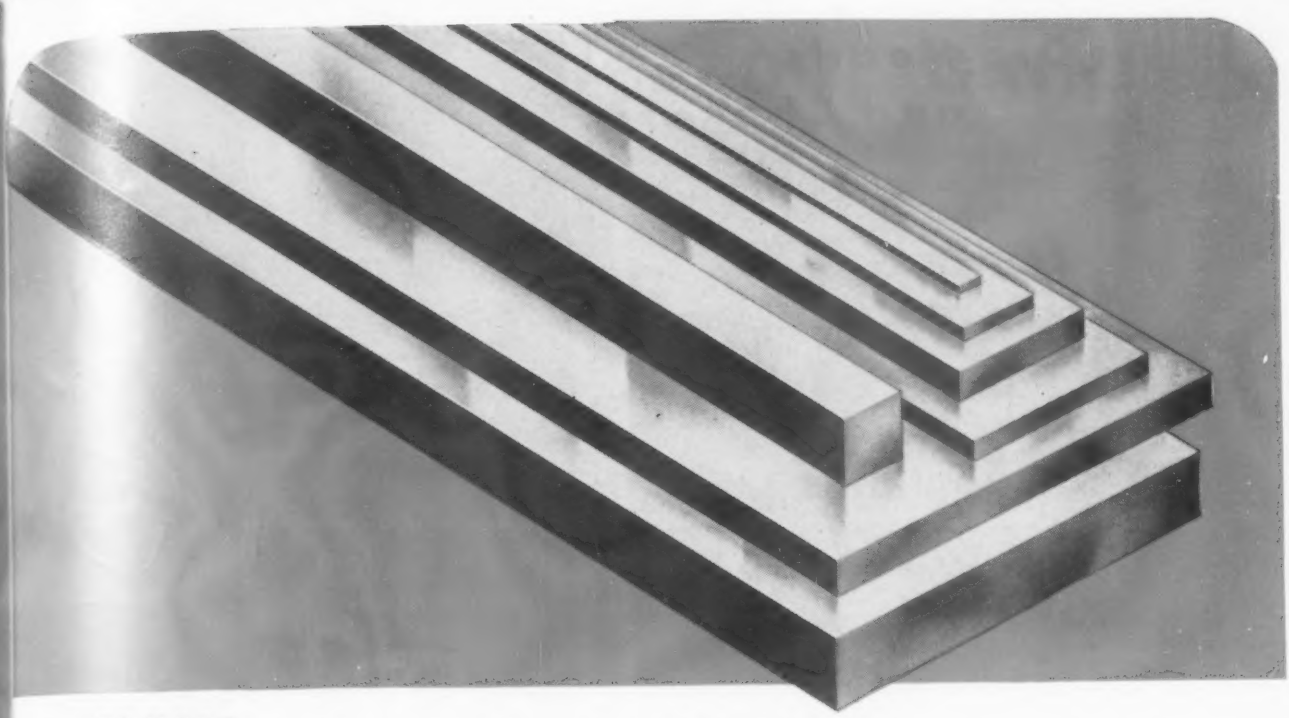
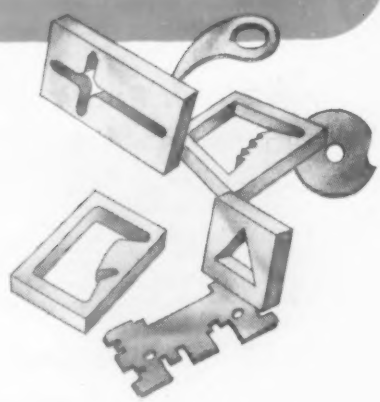


NOW... in addition to Oil-Hardening...

You can also offer this

NEW AIR-HARDENING

SIMONDS *FLAT GROUND* DIE STEEL



For longer-lived punches and dies . . . where greater production runs are needed between sharpenings . . . you can now get this new *Air-Hardening* type of Simonds Ground Die Steel, *which produces up to 50% more pieces per sharpening.*

5% chrome content makes this Air-Hardening Steel more wear-resistant and therefore better suited for punches and dies used on silicon or stainless steels, Monel, or other abrasive metals, and for gages and tools requiring top wear-resistance. What's more, this new *non-deforming* die steel is spheroidize-annealed for good machinability and consistently uniform hardenability. Wide hardening range of 1700 to 1800° F. makes it practically foolproof in heat-treating.

Furnished in many stock sizes in 36" lengths, all sizes are accurately ground to a thickness limit of plus or minus .001" with an extra-smooth surface finish of 25 to 35 micro-inches. Each piece is individually packaged, ready for scribing, shaping and heat-treating. See your Industrial Supply Distributor today.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Ore. Canadian Factory in Montreal, Que.

Die Heads and Chasers

are precision tools made from critical materials which are becoming more difficult to get. Therefore,

it is your patriotic DUTY

- ☆ To make these tools last as long as possible
- ☆ To prevent tool breakage
- ☆ To get the largest daily production from such tools
- ☆ To reduce the amount of spoiled and rejected work
- ☆ To save all worn out chasers for scrap salvage
- ☆ To see that your machine is in good condition so that these tools can perform properly and last longer

IF you are now using H & G Die Heads and will tell which styles and sizes, we will furnish helpful literature on the care of die heads and chasers, useful charts, and place your name on our mailing list for "Die Headlines".

IF you are NOT using H & G Die Heads, please attach the coupon to your business letterhead with your name and title. Bulletins are sent without charge or obligation.

Check Publications Wanted

- ☐ REVOLVING Insert Chaser Die Heads
- ☐ SOLID ADJUSTABLE Insert Chaser Die Heads
- ☐ TURRET LATHE Insert Chaser Die Heads
- ☐ H & G Threading Machine
- ☐ B&S AUTOMATICS Insert Chaser Die Heads
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- ☐ TAPER THREADING Insert Chaser Die Heads
- ☐ SPEED CHART

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MAKERS OF THE FAMOUS

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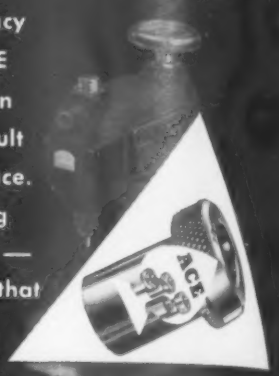
LIGHT-WAVE MEASURED

Accuracy

The meticulous accuracy and exactitude of ACE Drill Bushings is not an accident. It is the result of planned performance. It is why discriminating engineers specify ACE — precision drill guides that have no equal! Have you tried ACE yet?



ASK FOR CATALOG 1101-2

ACE DRILL BUSHING CO., INC.
5401 Fountain Avenue
Los Angeles 29, Calif.

Distributors in all principal Industrial areas. Write us for address of one nearest you.

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CUT COSTS . . . FASTEN "ON THE DOUBLE" with the Chicago "214" DOUBLE RIVET SETTER

The "214" automatically feeds, inserts and clinches two rivets at a time...with speed that may mean a big saving in your fastening costs.

14" throat makes large assemblies easy to handle. For tubular rivets as large as 9/64", or less in length. Quick Change Rotary Type Hoppers and Raceways permit a 5-minute changeover to rivets of different size. Adjustable anvils and riveting centers add to its versatility.

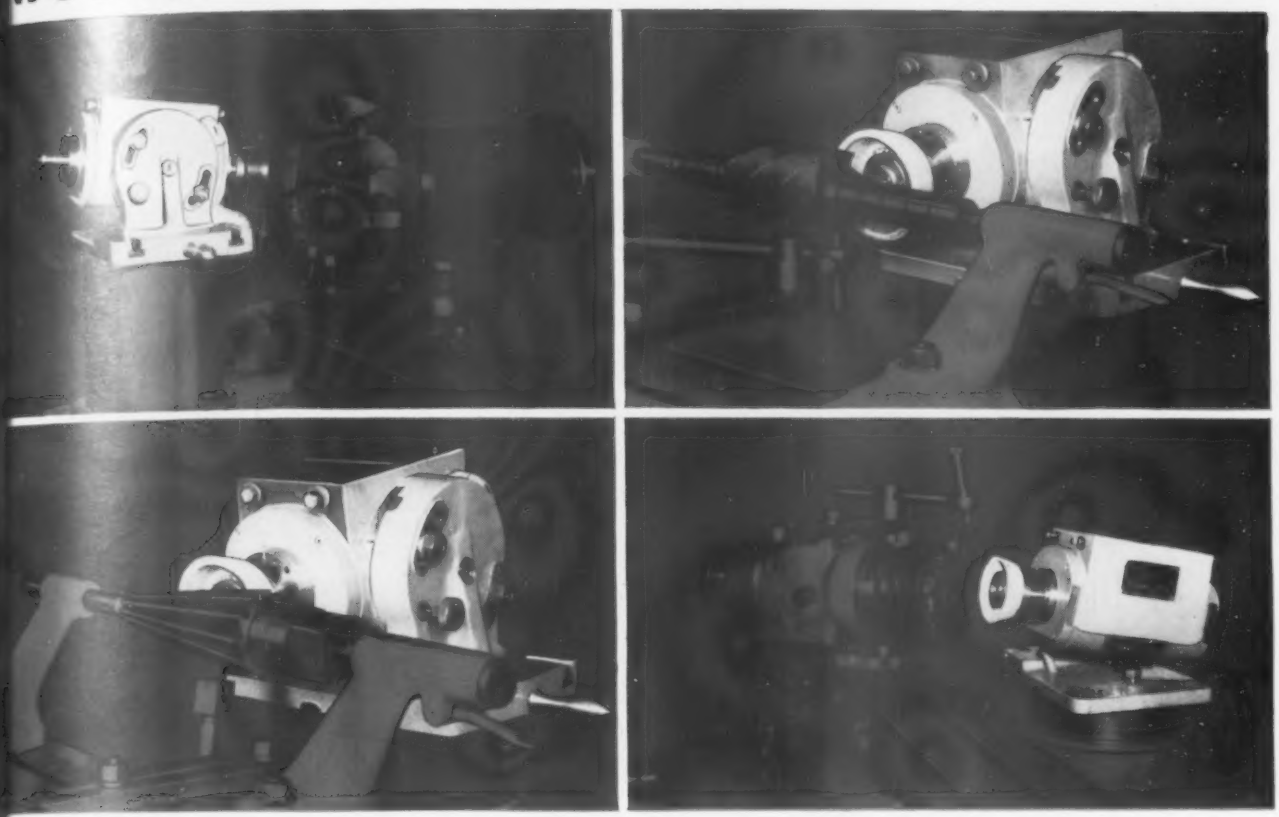
Ask us how the "214" can help you cut costs. Send a sample of your problem assembly (or blueprint) for a Free fastening analysis.

FREE CATALOG contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.

Chicago Rivet & MACHINE CO.
9619 West Jackson Boulevard, Bellwood (Chicago Suburb) Illinois
Branch Factory: Tyrone, Pa.

USE READER SERVICE CARD; INDICATE A-2-154-3

MODERNIZE YOUR TOOL GRINDER



THE NEW POPE SUPER PRECISION
1 HP, 3600 RPM MOTORIZED TOOL AND CUTTER GRINDER HEAD

With Angular Adjustment In A Vertical Plane

Specify this new and better motorized Spindle on your next tool and cutter grinder.

Replace less effective, less versatile heads on your present grinders.

This totally enclosed POPE Spindle with sealed-in lubrication has the radial and axial rigidity to make wheels cut faster — spark out quicker.

It produces the kind of cutting edge on your tools that stands up and cuts longer.

It is easy to install.

It reduces set-up time.

It reduces grinding time.

Ask us for a quotation

No. 82

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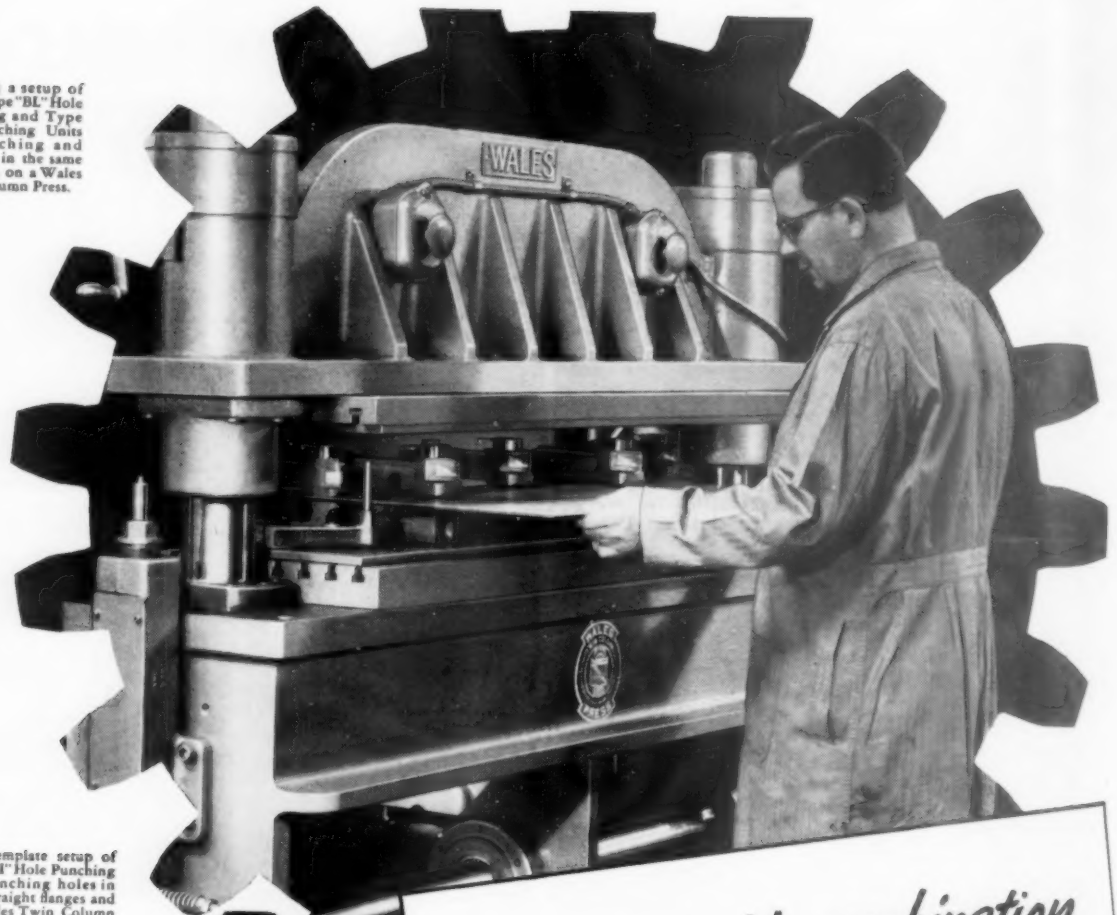

Showing a setup of Wales Type "BL" Hole Punching and Type "N" Notching Units for punching and notching in the same operation on a Wales Twin Column Press.

Showing a template setup of Wales Type "H" Hole Punching Units for punching holes in curved and straight flanges and rims on a Wales Twin Column Press.

Showing a Wales Twin Column Press with the Wales Multiple Hole Punching System operating on a press bed.

an unbeatable combination

WALES HOLE PUNCHING AND NOTCHING UNITS *and* WALES TWIN COLUMN PRESSES

● A typical example of the unique design built into Wales Twin Column Presses is the double crank pull down drive on the pair of ram guides. This feature provides equal pressure on both ends of ram and assures parallel alignment of ram to press bed.

Also this alignment feature works hand-in-hand with the exclusive, independent, self-contained Wales Hole Punching and Notching Units with built-in punches and dies which are held in perfect alignment by holders. In addition, Wales Units do *not* require die sets as nothing is attached to press ram.

Have the complete story *of this unbeatable combination* at your fingertips by writing for fully-illustrated, functionally-colored catalogs TODAY.

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GEORGE F. WALES, *Chairman*
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WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO
Specialists in Punching and Notching Equipment

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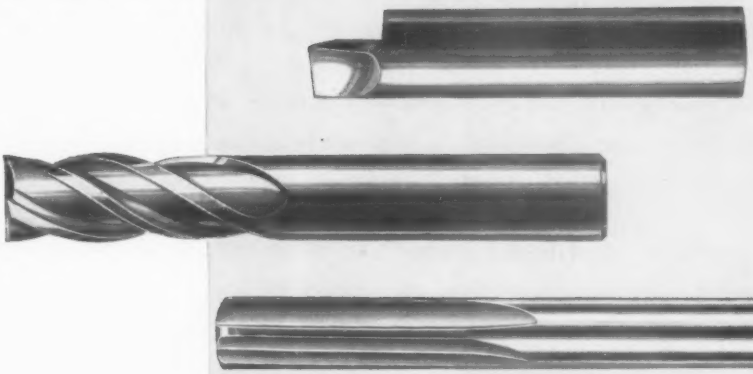
They're TUNGSTEN CARBIDE



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Showing a setup of Wales Type "BL" Hole Punching and Type "N" Notching Units for punching and notching in the same operation on a Wales Twin Column Press.

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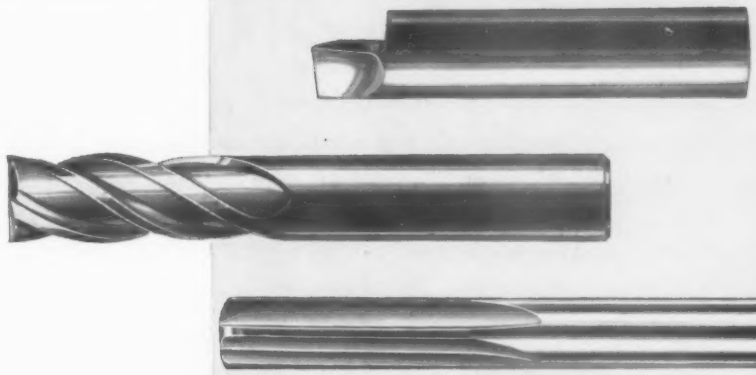
● A Great Advance In Linear Positioni...

They're TUNGSTEN CARBIDE



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FASTER, MORE DEPENDABLE LINEAR MEASUREMENTS TO TENTHS

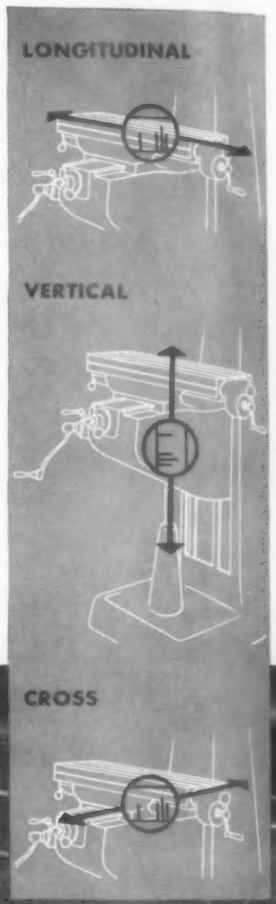
Many vertical millers equipped with Scan-A-Scales do work formerly requiring a jig borer.

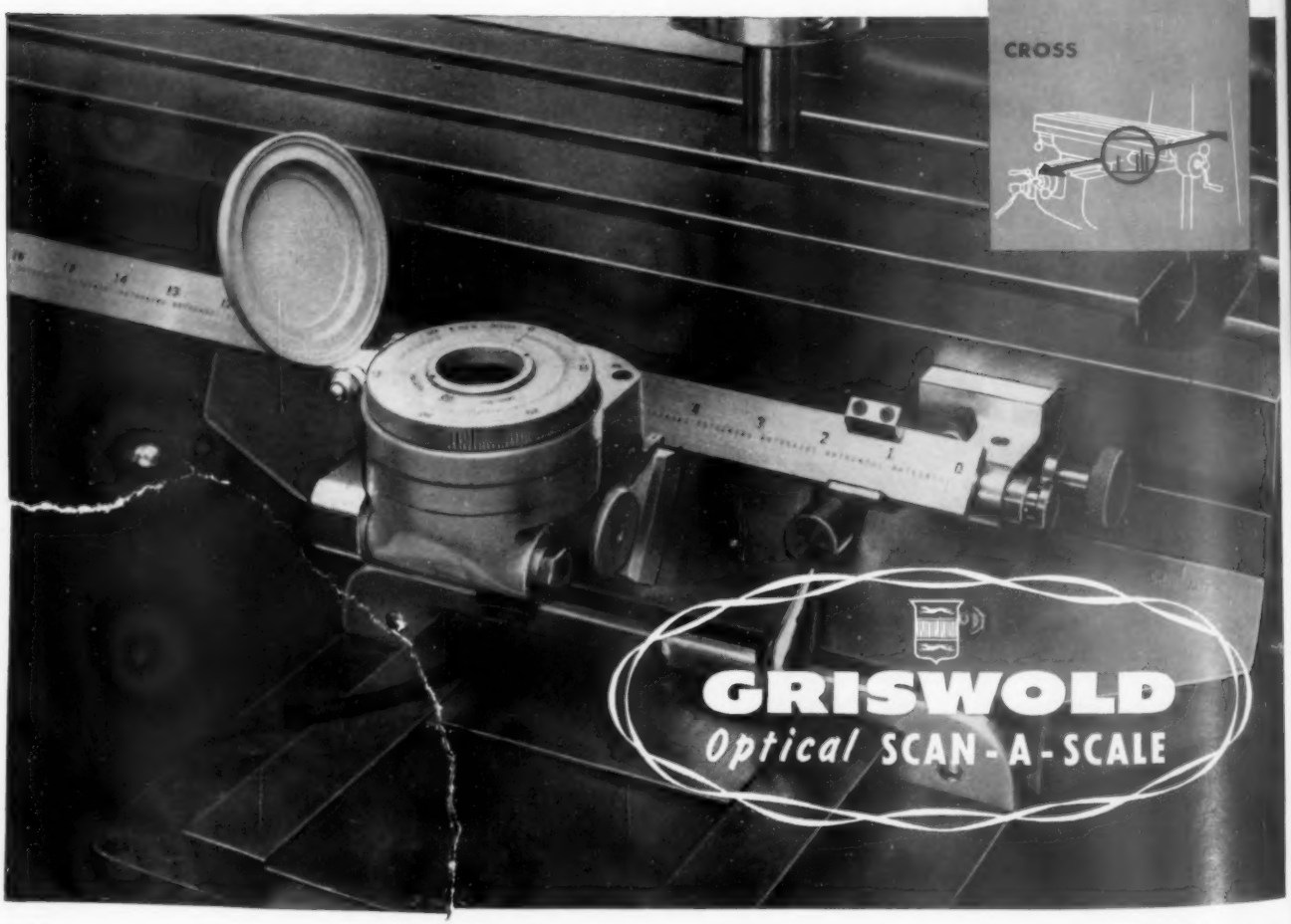
Scan-A-Scales permit direct visual settings, at normal reading distances, with all the advantages of optical precision. Inaccuracies due to variations in pressure at which a reading is taken, inherent in dial indicators, micrometers and loose standards, are eliminated.

Scan-A-Scale readings are quickly made and dependable, independent of dirt or temperature changes due to handling. They cannot be damaged by power feeds. No zero setting or focusing is required.

Today, Scan-A-Scales are bringing a new order of reproducible accuracy on large horizontal boring mills, lathe carriages, milling machines and cylindrical grinders, wherever linear positioning is important. They can speed work, increase accuracy for you.

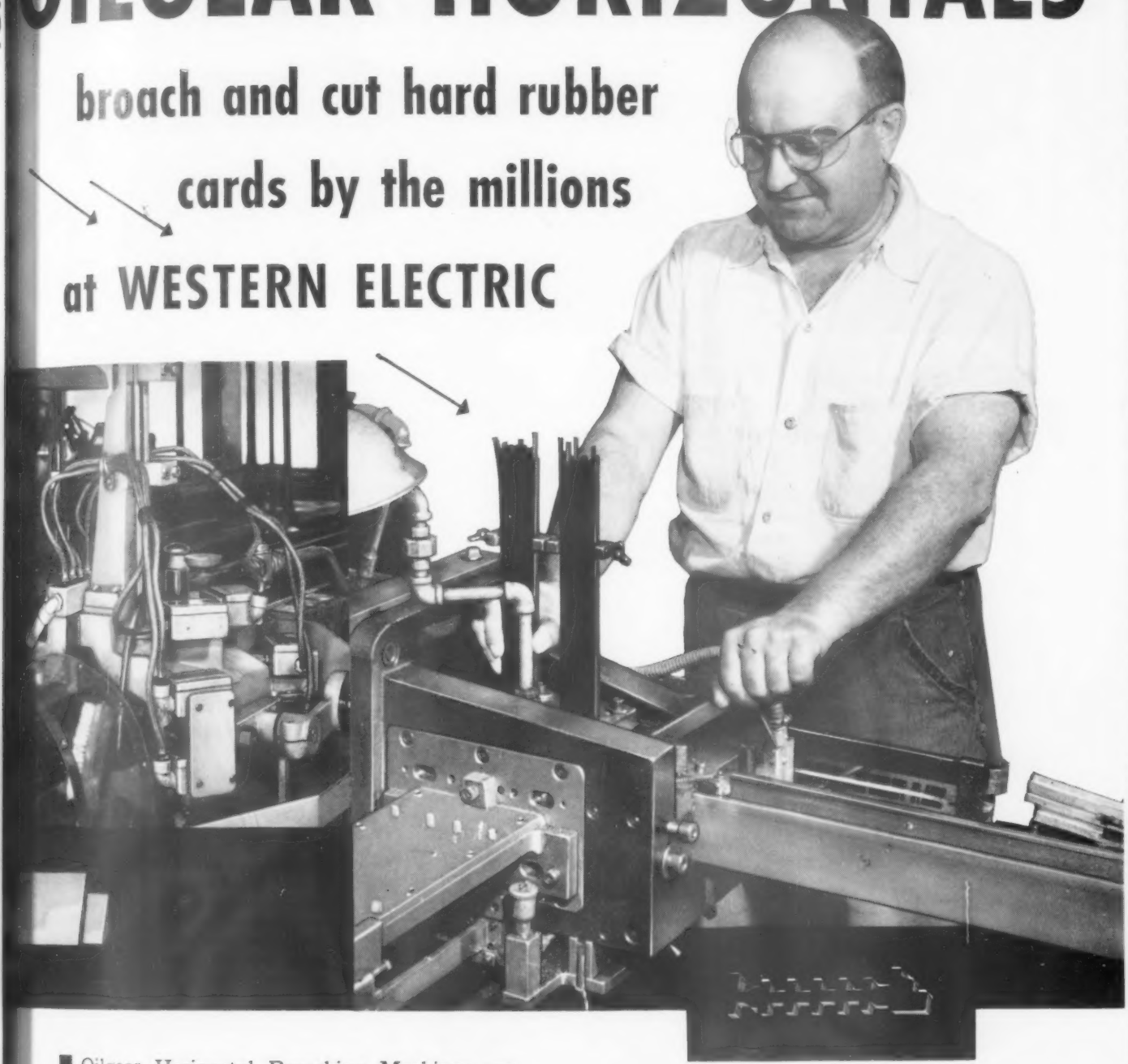
SEND FOR DATA. A complete, illustrated catalog describing Scan-A-Scales is sent free on request to the F. T. Griswold Mfg. Co., Wayne, Pa.





OILGEAR HORIZONTALS

broach and cut hard rubber cards by the millions at WESTERN ELECTRIC



■ Oilgear Horizontal Broaching Machines are used by Western Electric in the broaching and cutting of separators or operating "cards" from hard rubber stock. Used by the millions annually in dial telephone exchanges, these cards must meet precision contour requirements.

A battery of four Oilgear XL-6 x 48″ stroke horizontal broaching machines is used to form-broach and cut these hard rubber cards. Each Oilgear Horizontal broaches and cuts 50 cards in a single pass from bundles of strips (1/16″ x 1 1/4″ x 23 3/8″) that are ground on each side to accurate dimensions. Each machine has a capacity of 12 to 13 million cards per year. These Oilgear Horizontals have been in service a number of years. Elsewhere, Oilgear Horizontals are used to broach and shape similar parts from phenolic stock.

Oilgear Horizontal Broaching Machines indeed have great versatility, can be adapted to many uses, afford great productive capacity. These machines have as standard equipment many features available on no other machines or available only at extra cost. The same performance and dependability that interest careful and rigorous buyers in many industries should interest you. Write for Bulletin 20000B on the Oilgear Horizontals. Also other bulletins on the Verticals. THE OILGEAR COMPANY, 1573 W. Pierce St., Milwaukee 4, Wisconsin.

OILGEAR

Oilgear

PIONEERS IN FLUID POWER

BROACHING MACHINES AND PRESSES

POSITIVE VISIBLE CONTROL *The* NILCO WAY

COMPARATOR DIAL SNAP GAGE

Enables inspector to use both hands for checking. Note that the weight of part rests on solid anvil.

THE FASTEST, MOST ACCURATE MODERN METHOD TO CHECK INTERNAL GROOVE DIAMETERS

The Nilco Dial Groove Gage is a self-positioning precision instrument especially designed to provide POSITIVE CONTROL in checking diameters of internal grooves and recesses, Truarc and "O" rings, oil grooves, washer grooves, etc. Because of its unique design and patented features the Nilco Dial Groove Gage can be used efficiently by both skilled and unskilled personnel in maintaining quality control and inspection throughout production.
Setting can be made direct to master ring gage, a gage block combination, or micrometer.
Illustrations and literature are available on this gage and also on the companion dial groove location gage for checking internal groove locations.

DIAL SNAP GAGE AND MASTER WITH STAND

Correct readings are obtained at once. There is no need of rocking back and forth, so often required in ordinary dial snap gages. This speeds operation of turning or grinding when it is important to know how much is left on the diameter; .0001 indicator quickly reflects the size on the gage, giving control, confidence, and speed to the operator.

LARGE SIZE SNAP GAGE

Even for large diameters, gage is light, compact, easy to handle. Will repeat. Nilco dial snap gages make possible close shoulder checking, radius guides applicable on request.

SMALL DIAL BORE GAGES

This fastest setting dial bore gage provides the operator control on small bores in graduations of .0001". Three models cover the range from 3/8" to 1".

VISIT OUR BOOTH 533
ASTE SHOW
MARCH 17-21, 1952

LARGE DIAL BORE GAGES

Checking internal diameter quickly, easily; simple setting to gage blocks or master ring No skill needed for setting or checking. Compactness and simplicity of design make possible five models in standard or pistol grip design from 1" to 12".

Also, all types of dial snap gages, dial bore gage, internal and external dial spline gages for checking pitch diameter of gears and splines. New NILCO DIAL GROOVE LOCATION GAGE, AGD plain plug and ring gages.

ENGINEERS

NILCO

IN GAGES

NILSSON GAGE CO., INC. POUGHKEEPSIE, N. Y.

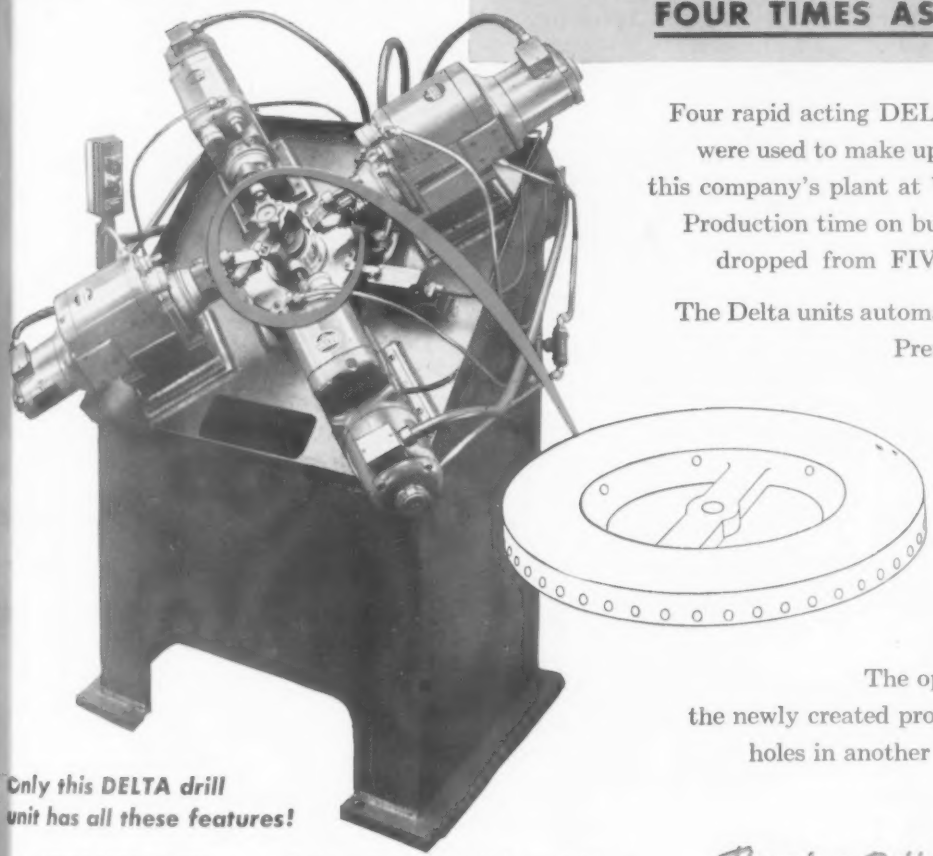
Oilgear Horizontal Broaching Machines indeed have great versatility, can be adapted to many uses, afford

PIONEERS IN FLUID POWER
BROACHING MACHINES AND PRESSES

Stove Maker Boosts Production 400%

with the NEW DELTA Air POWERED Hydraulic DRILL UNIT

PRENTISS-WABER PRODUCTS COMPANY
Now Drills Gas Stove Burner Cap Holes
FOUR TIMES AS FAST!



Four rapid acting DELTA Model 19-150 Drill Units were used to make up a special-purpose machine at this company's plant at Wisconsin Rapids, Wisconsin. Production time on burner cap drilling immediately dropped from FIVE minutes to ONE minute!

The Delta units automatically drill 48 No. 37 holes in Prentiss-Waber's standard burner caps in 0.94 minutes, and 56 holes in their giant burner caps in 1.01 minutes. After the part is loaded, the machine automatically completes 12 consecutive cycles of drill, index, drill and index—then stops itself. The operator in the meantime using the newly created production time, drills six No. 37 holes in another burner cap!—a free operation any way you look at it . . .

Only this DELTA drill unit has all these features!

- **HYDRAULIC FEED** . . . quickly adjusted, infinitely variable—no recamming or changing lead screws to alter feed.
- **RAPID TRAVERSE** . . . quick, accurate, positive control—no over-travel; reduces tool breakage. Approach consistently at 5 to 6 inches per second to within .010 inch of work.
- **DEPTH CONTROL** . . . quick, accurate, positive—no over-travel; repeats depth consistently to within .0005 inch.
- **UNIVERSAL MOUNTING** . . . units can mount in any position.
- **AUTOMATIC CYCLING** . . . built-in cycle control switches provide for full electrical remote control. Eliminates installing external switches. Drilling units positively electrically interlocked with automatic indexing table.
- **SPECIAL SPINDLES** . . . drive arrangements and other features are available at slight additional cost, including new two-way valve to permit spindle to function with normal rapid retraction or to back feed, as desired.

Two sizes—capacities up to 5/16-inch diameter drill and 5/8-inch diameter drill.

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Specify VAN KEUREN Wire Type Plug Gages on your drawings for all sizes from .010" to .500" diameter. Taper Insert Plug Gages in this range are a waste of time and money.

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Stocked in sizes from .010 to .050". Available at no extra cost.

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5 times the life of steel at 50% additional cost. Available in sizes from .016 to 1.000".

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How to braze with one finger!

Yes Sir—one finger is all you need to turn out a steady stream of beautifully brazed assemblies. And that finger doesn't have to be specially educated. All it has to be able to do is—flip a little electric switch.

For example—here's a complete brazing production set-up in one compact little package that takes up only about 8 square feet of floor space. It's a neat application of the sure-fire EASY-FLO formula for fast, low-cost brazing production where you — (1) *preplace the alloy*—(2) *use a fast heating method*—(3) *devise a set-up that keeps assemblies moving steadily to and through the heating zone.*

The Parts the unit was designed to braze are shown at right — a steel tube section and a steel stamping.

Approximately ½ Actual Size

How It Works— Operator flips a switch. This starts a little 110 V motor that drives an endless chain of flat links. Close-up below shows construction. From now on all operator does is — assemble parts on the chain jigs, place a ring of 3/64" EASY-FLO 45 wire on each assembly (right) and apply HANDY FLUX.

UNIT was designed and built by Youngberg Bros., Meriden, Conn. Equipment like this doesn't cost much, and that cost is quickly made up by the time and labor it saves.

Heating Cycle — Chain speed is timed for proper heating. As assemblies move between rows of gas-air burners, rack engages teeth on jigs and rotates them, assuring uniform heating. The EASY-FLO 45 ring flows and sets before assemblies reach end where they are deflected into quenching tank.

Production — Every 16 seconds a finished EASY-FLO brazed assembly, drops into the tank. That means 225 per hour — and any operator — he or she — can do it.

THIS CLOSE-UP *with metal covers removed, shows the geared jigs and rack and gas-air burners. Vertical pins support and position stamping on tube.*

BULLETIN 20 TELLS ALL ABOUT EASY-FLO BRAZING

This 24-page bulletin is a "must" for all who design and produce metal assemblies. It explains why great strength, speed and economy are inherent in EASY-FLO brazing — and it's packed with useful information about joint design and fast production methods. Write today for a copy.

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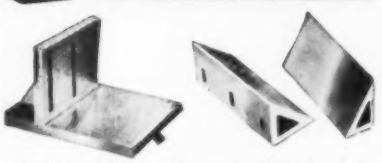

Surface Plates Rescraped Like New

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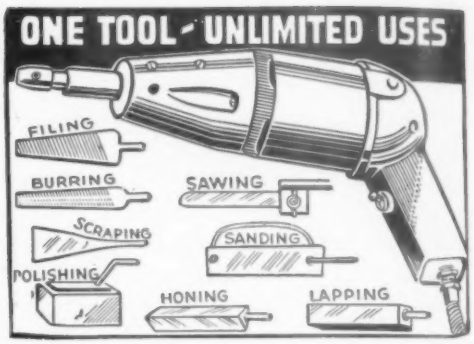

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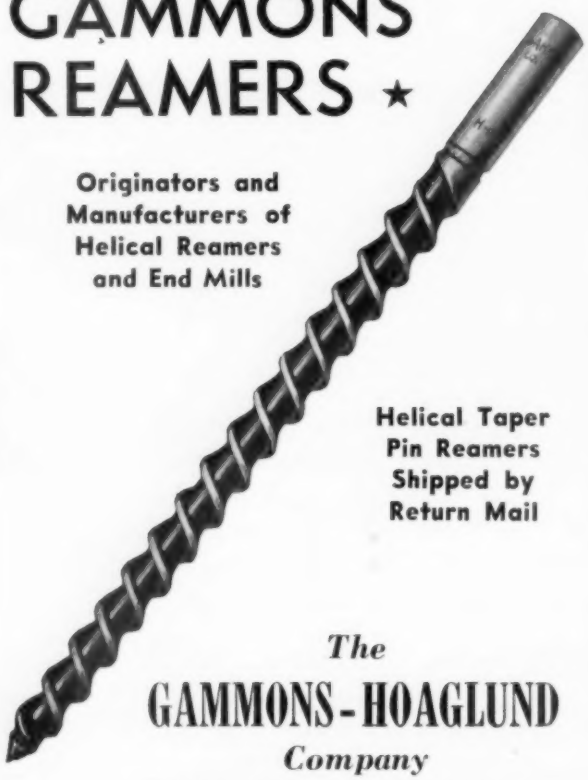

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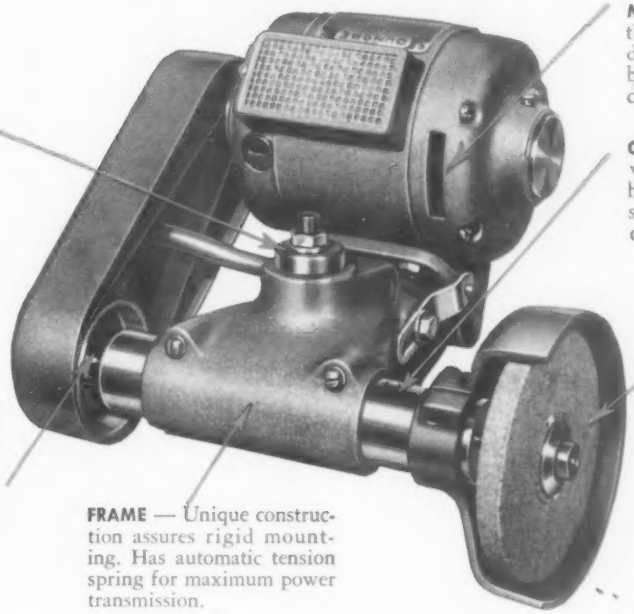

MOTOR — Dumore quality throughout. Rotating parts dynamically balanced. Ball bearings are selected to precise standards.

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PULLEYS — Interchangeable pulleys give wide speed range. Balanced to increase belt life and insure efficient power. Inspected to prevent vibration and chatter.

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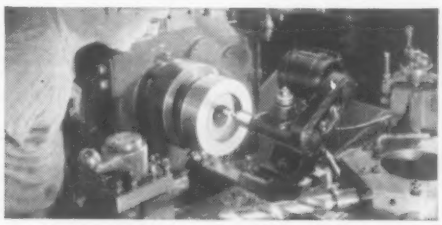
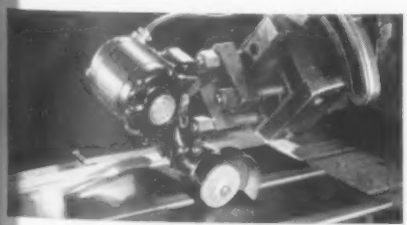
Dumore grinder mounted vertically on Bridgeport Mill for internal grinding.

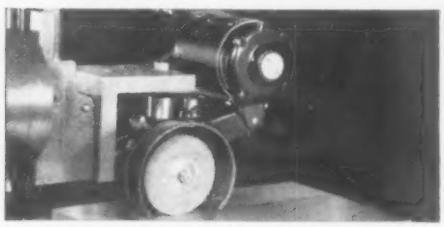


Mounted on a Turret Lathe, Dumore Grinder takes its turn in sequence of operations.

Bench mounting is easiest of all. Easily combines with special fixtures for efficient service.



Mount a Dumore Grinder on the clapper box of a planer for surface grinding.



Dumore Grinder mounted on ram of shaper with right angle plate for surface grinding.

AND so it goes. The Dumore Tool Post Grinder is so *versatile* it can be mounted on any standard machine. So *accurate* it can perform internal operations to .0001".

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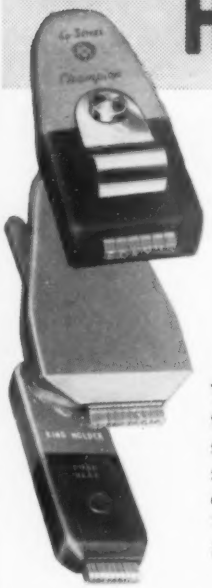

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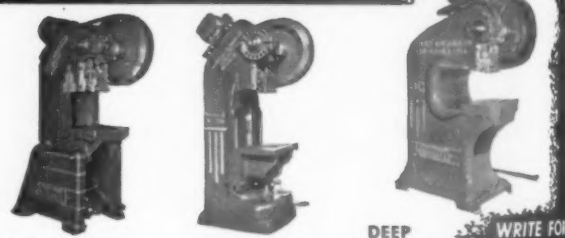

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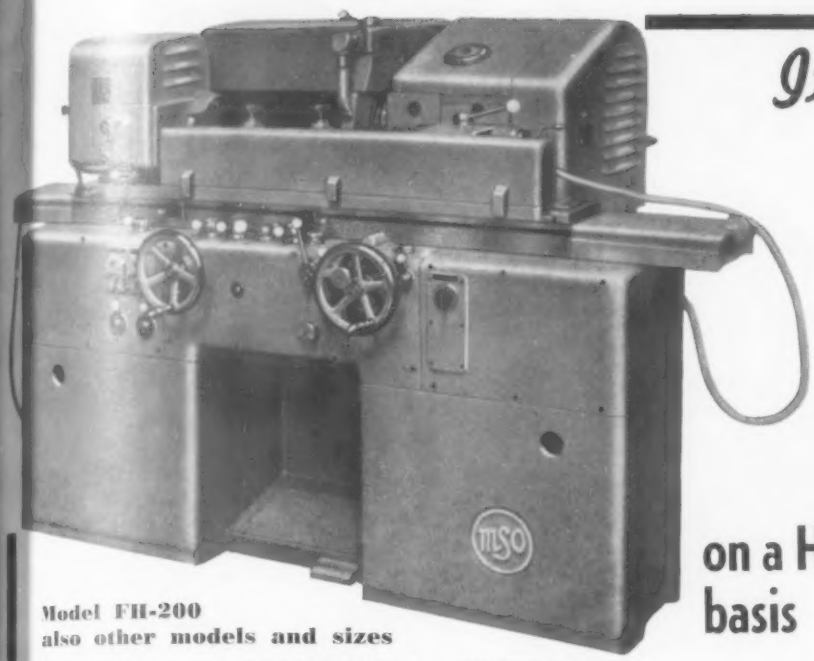

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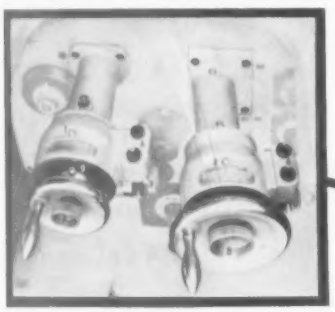

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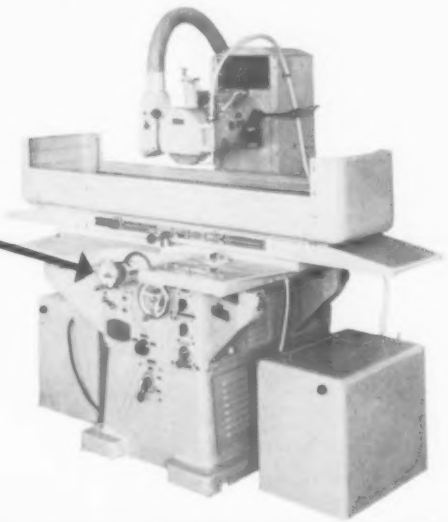

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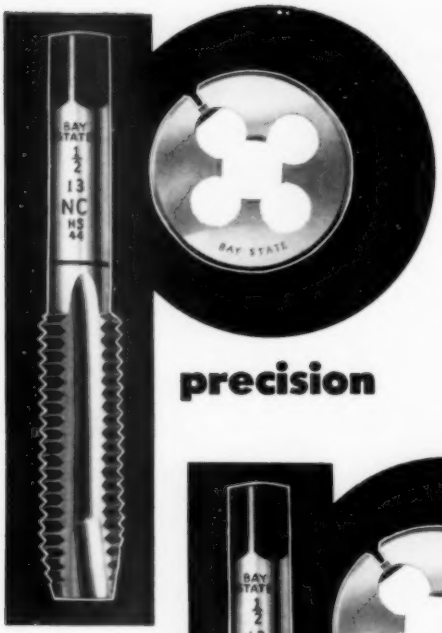

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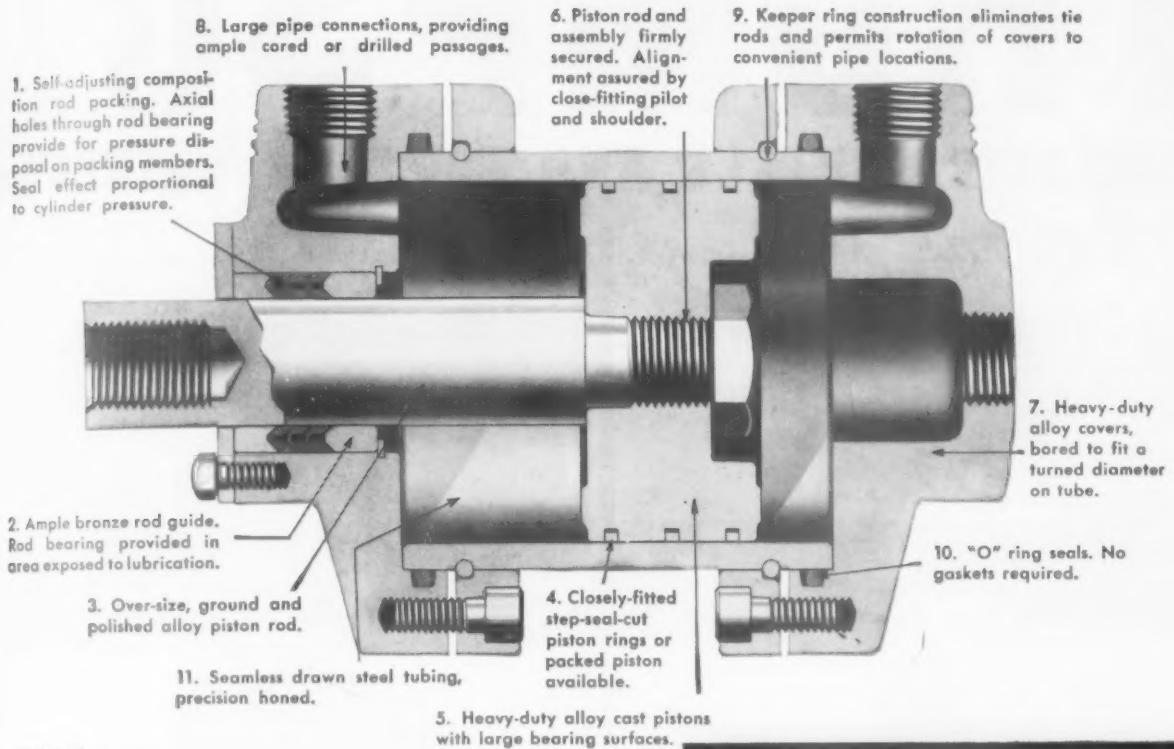
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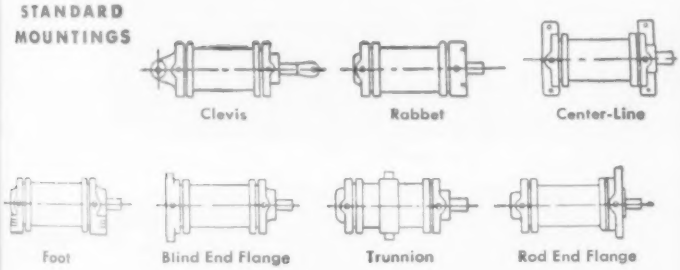

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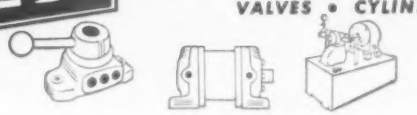

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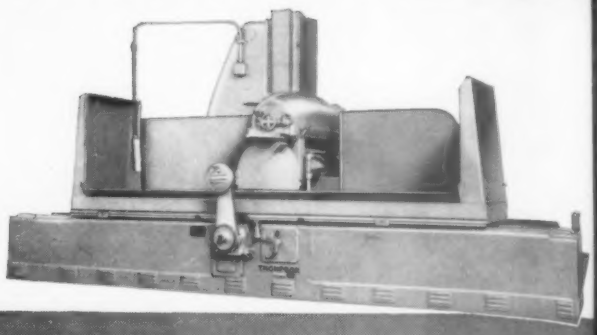

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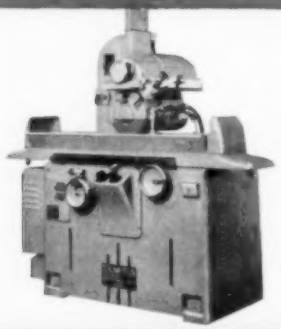

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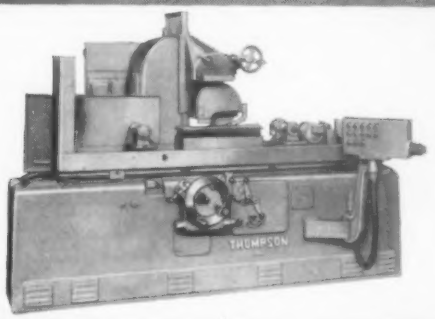
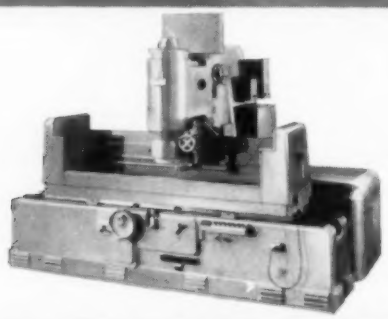
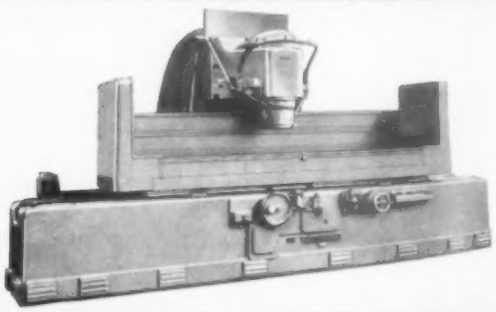


TYPE B & C TRUFORM Contour Grinders for all shapes sizes 10x12x20 to 14x16x54



FIXED COLUMN VERTICAL SPINDLE Production Surface Grinders sizes 12x18x36 to 28x24x120



SLIDING COLUMN VERTICAL HYDROVERT For obstructed or multi-level surfaces sizes 16x24x48 to 48x54x192

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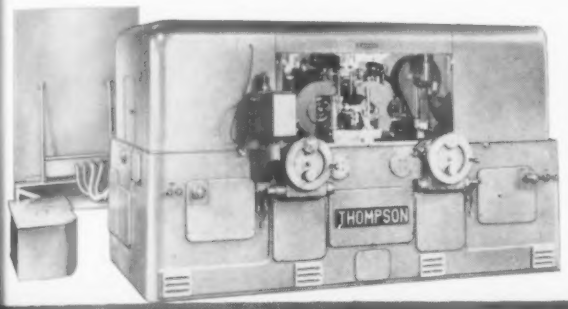
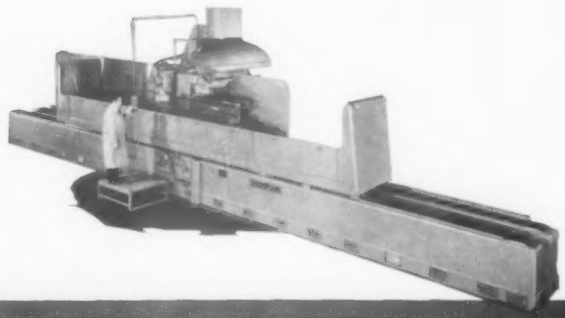
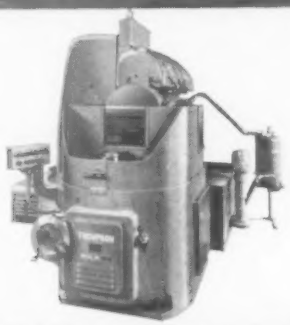


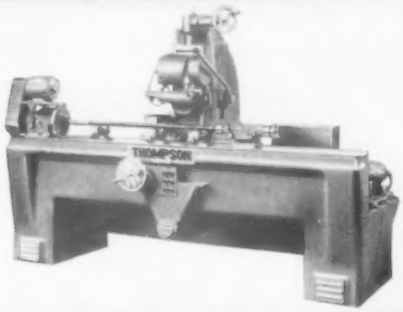
DOUBLE WHEEL BUCKET AND BLADE GRINDER for jet aircraft



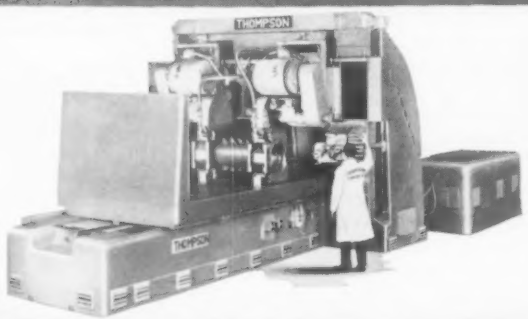
WAY GRINDERS Many sizes and types from 12x11x48 to 30x50x240



TWIN CHUCK ROTARY GRINDER For grinding circular metal discs 6 to 12 inch and 6 to 16 inch sizes



NEW SERIES 600 MANUAL BROACH GRINDER sizes 6x48 to 6x84



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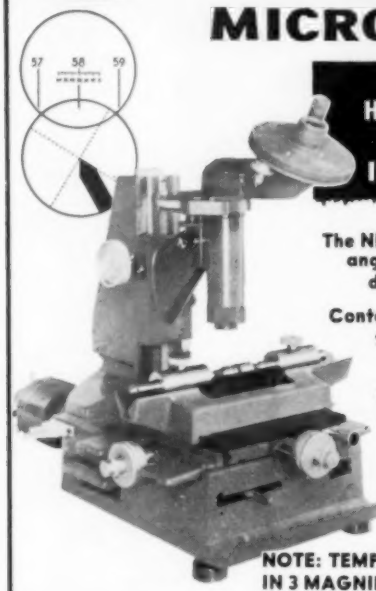

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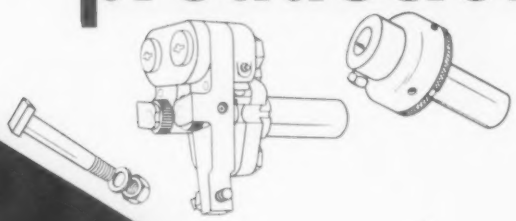

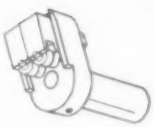

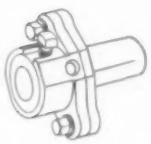

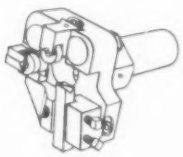

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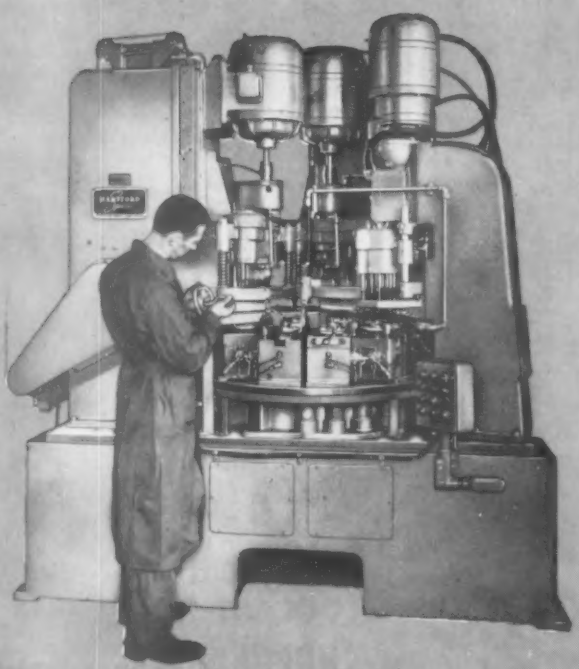

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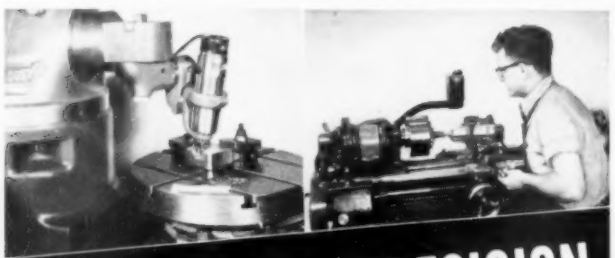

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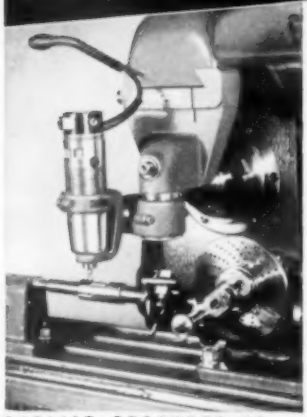

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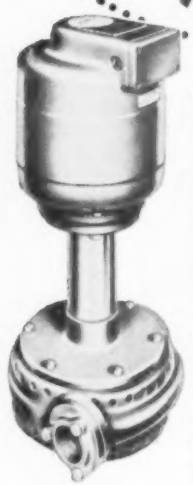

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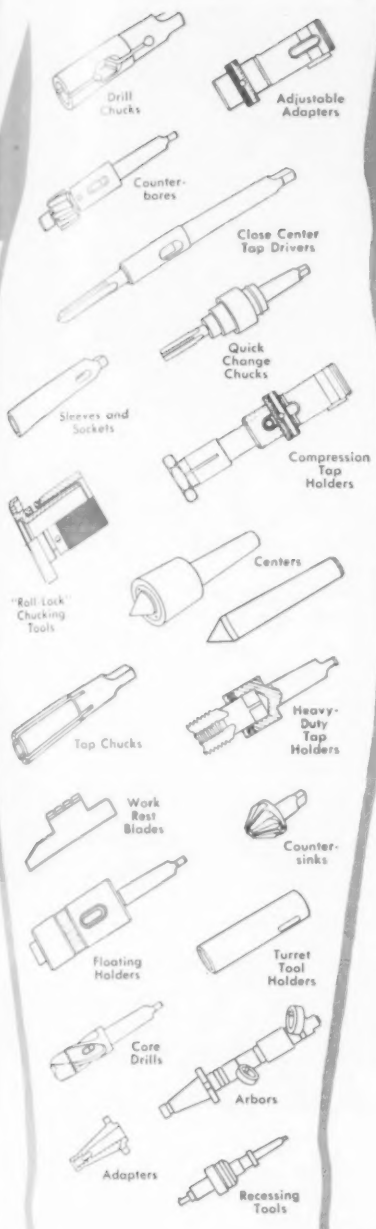

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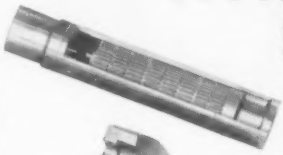
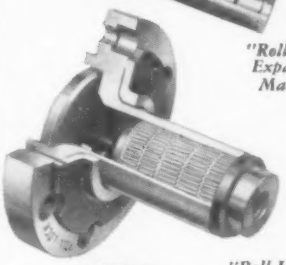
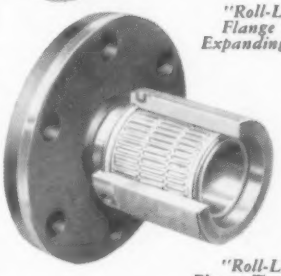




"Roll-Lock" Expanding Mandrel



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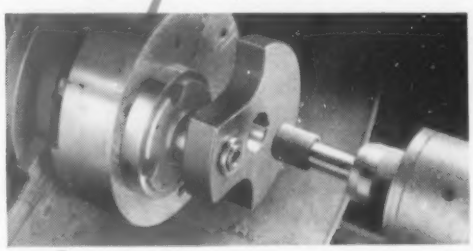

Shown to the right are two of the many applications in turning, grinding or inspection operations. "Roll-Lock" Flange Type Expanding Arbor and Tool Chuck being used in a finish grinding machine for holding the work and grinding tool.

**"Roll-Lock" is a trade mark of Scully-Jones and Company.*

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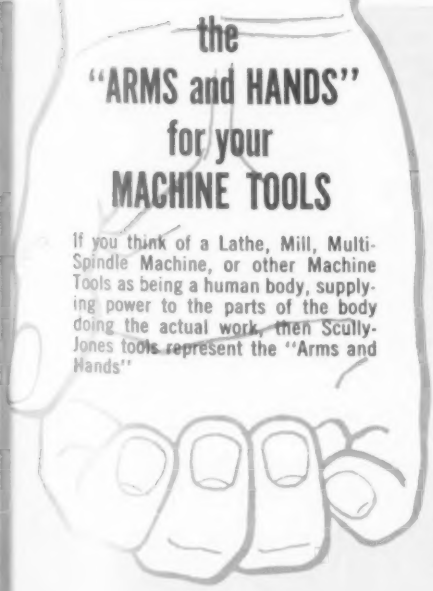

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Our plant is equipped with many special machines of our own design which perform the necessary operations with note-worthy accuracy.

Our engineers, trained in this particular field are expert designers of production tools, consequently DETTERBECK QUALITY TOOLS perform with guaranteed satisfaction.

Under normal conditions we maintain 24 hour service. We carry large stocks of standard tools on hand for immediate shipment. During times of emergency our service is in keeping with raw material procurement.

Your orders in our hands is your assurance of finest quality tools at a saving in cost . . . dependable service in production.

NOTICE

It has come to our attention that another concern with a name somewhat similar to ours, has mailed out change of address notices to the trade which has misled some of our customers into changing our address on their records.

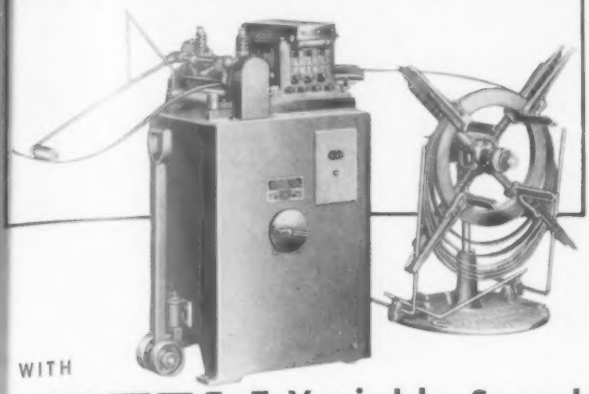
This notice is to correct any such impression. The address below is our correct address . . . and has been for over 40 years.

We have no branch factories.

Geo L Detterbeck
President

GEORGE L. DETTERBECK CO., Incorporated.
1871 Clybourn Ave., Chicago 14, Ill.
ENGINEERS TO AN INDUSTRY

STRAIGHTEN COIL STOCK
FOR PRESSES, SHEARS OR SLITTERS



WITH

LITTELL Variable Speed STRAIGHTENING MACHINES

Output rises, costs drop when coil stock is fed to the press, the shear, or the slitter through a Littell Straightening Machine. Coil stock comes out of a Littell Straightener flat, with curvature removed. Equipped with variable speed transmissions, Littell Straighteners are easily adjusted to meet a wide range of speed requirements. Thirteen medium and heavy duty models straighten coil stock of all standard widths and thickness.

F. J. LITTELL MACHINE CO.

WRITE FOR CATALOG

ROLL FEEDS • DIAL FEEDS • STRAIGHTENING MACHINES • REELS • AIR BLAST VALVES

District Offices: Detroit, Cleveland

4199 N. RAVENSWOOD AVE. • CHICAGO 13, ILL.

USE READER SERVICE CARD; INDICATE A-2-181-2

See the Results
OF THE ZIEGLER HOLDER!

When you use a Ziegler Tool Holder on tapping or reaming jobs, you'll see at once what a difference it makes in the results produced.

One result is the elimination of over-size and bell-mouthed holes — which means fewer rejects to be charged to spoilage losses.

Another result is the saving in set-up time, because, with the Ziegler Holder the work does not have to be so accurately aligned with the spindle. This means reduced labor costs.

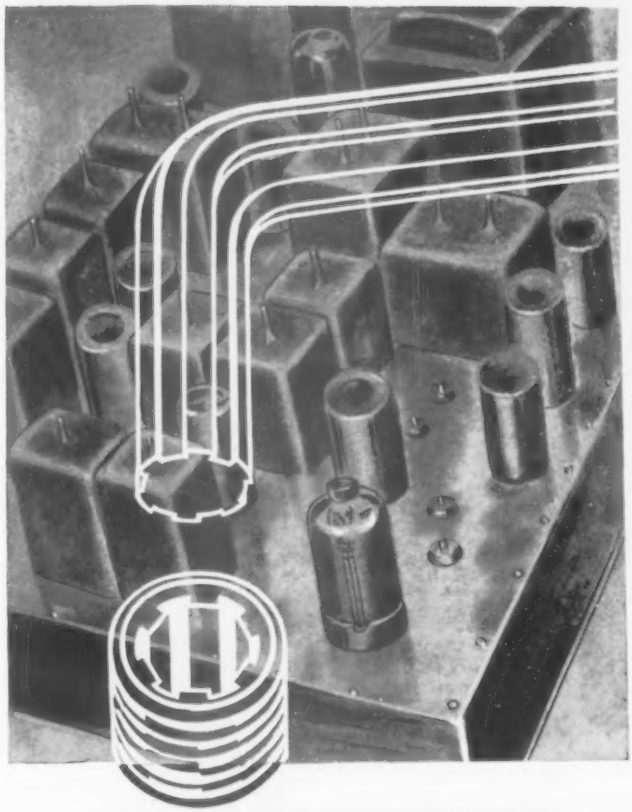
No wonder the Ziegler Holder is coming into more and more widespread use. It means a definite money-saving to all who use it.

W. M. ZIEGLER TOOL COMPANY
13574 Auburn Detroit 23, Michigan

WRITE FOR CATALOG

Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...

USE READER SERVICE CARD; INDICATE A-2-181-3



THE RIGHT PLACE
for a tighter fastener

In communications apparatus and other equipment subject to vibration . . . use Bristol's Multiple-Spline Socket Screws.

They *hold* tighter . . . because they can be *tightened* tighter.

Even in the smallest sizes, they can be turned up far tighter without danger of bursting or rounding out socket walls. The exclusive multiple-spline socket turns internal wrenching force into rotary motion, not expanding pressure.

Other advantages: ideal for compact assemblies and hard-to-get-at fastening points. For disassembly, a reverse flick of wrench loosens the set.

Only BRISTOL gives you the right socket screw for every application

BRISTOL'S

Multiple-Spline and Hex Socket Screws... Cap and Set

SEND COUPON FOR FREE SAMPLES — also helpful bulletins on designing compact, tight assemblies.

THE BRISTOL COMPANY
Mill Supply Division
128 Bristol Road, Waterbury 20, Conn.

Please send me free sample of Bristol's Multiple Spline Screw and bulletins showing applications to:

NAME . . . . .
COMPANY . . . . .
ADDRESS . . . . .
CITY . . . . . ZONE . . . STATE . . . . .
Screw Sizes . . . . .
Our problem is mainly . . . . . VIBRATION ☐
COMPACT DESIGN ☐ FREQUENT TAKE-APART ☐

USE READER SERVICE CARD; INDICATE A-2-181-1

Glenzer Utility Tools

Utility Sleeves

Removable Taper Shanks allow use of lower cost straight shank small tools. Ask for Data folder I-A.

Floating Tool Holders

"GLENCO" Tool Holders compensate for misalignment up to 1/32" radius. Save set-up time —assure perfect work from worn machines. Ask for Data folder I-J.

Precision Friction-less Live Centers

Cushioned to reduce tool breakage— Timken Roller Bearings for accuracy, long life. Ask for Data folder I-D.

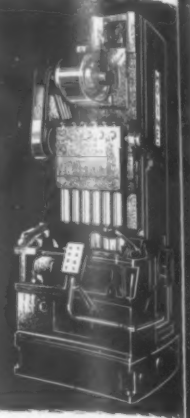
35 YEARS
of
Specialized Service
to American Industry

Glenzer Utility Tools have demonstrated their advantages so convincingly that they are specified as standard by more and more companies, year after year.

THE J. C. GLENZER CO., Inc.
1552 E. NINE MILE ROAD, DETROIT 20, MICH.

USE READER SERVICE CARD; INDICATE A-2-182-1

FOR OVER 50 YEARS
MOLINE "Hole-Hog"
SPECIALLY DESIGNED
MACHINE TOOLS
HAVE CUT PRODUCTION COSTS
FOR AMERICAN INDUSTRY



MOLINE TOOL CO.
"HOLE-HOG"
MOLINE, ILLINOIS

DRILLING
BORING
HONING
TAPPING and
Special Machines

USE READER SERVICE CARD; INDICATE A-2-182-2

Fellows

MACHINES and TOOLS
FOR CUTTING
. . . SHAVING
. . . BURNISHING
AND INSPECTION
in GEAR PRODUCTION

FELLOWS

THE FELLOWS GEAR SHAPER COMPANY, SPRINGFIELD, VERMONT

USE READER SERVICE CARD; INDICATE A-2-182-3

Acme Offers
Complete Facilities for

PRECISION GRINDING

FAST SERVICE... LOW COST

- INTERNAL
- EXTERNAL
- CRUSH FORM
- CENTERLESS
- TWIN DISC
- SURFACE
- THREAD

Acme is equipped to handle all types of precision grinding. Expert craftsmen, using newest methods and modern equipment, will do the job for you faster, better, more economically. Acme also offers a flat lapping service that can finish surfaces to within millionths. Write for details.

Acme Industrial Company
Makers of Standardized Jig & Fixture Bushings
200 N. LAFLIN STREET • CHICAGO 7, ILLINOIS

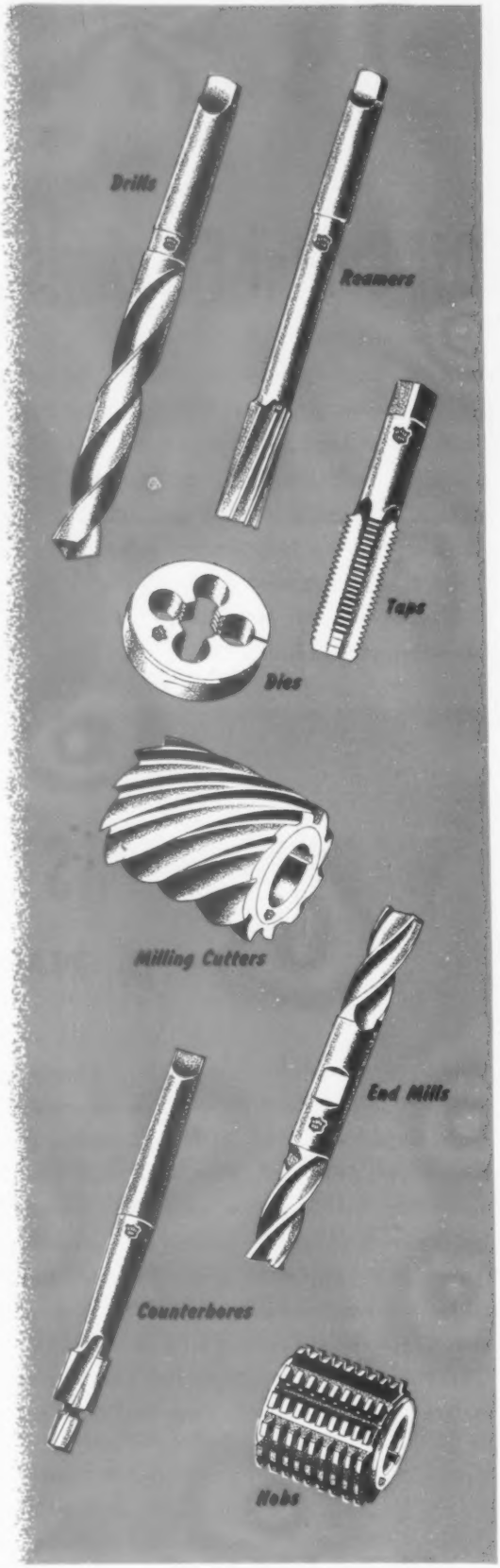
THE SERVICE SHOP TO INDUSTRY FOR MORE THAN 25 YEARS

USE READER SERVICE CARD; INDICATE A-2-182-4

Best Drillmaster in the business

SINCE 1882 Red Shield Drills have been specified and used by the big producers and by thousands of small machine shops in every state in the Union. They are foremost quality in design, material and workmanship.

The same quality and reliability is built into our reamers, taps, dies, milling cutters, end mills, hobs, counterbores and special tools. Standardize your cutting tool requirements by specifying Standard Red Shield Tools. One source gives you the advantage of undivided responsibility. Standard Tool Distributors in more than 500 cities, coast to coast, can supply you.



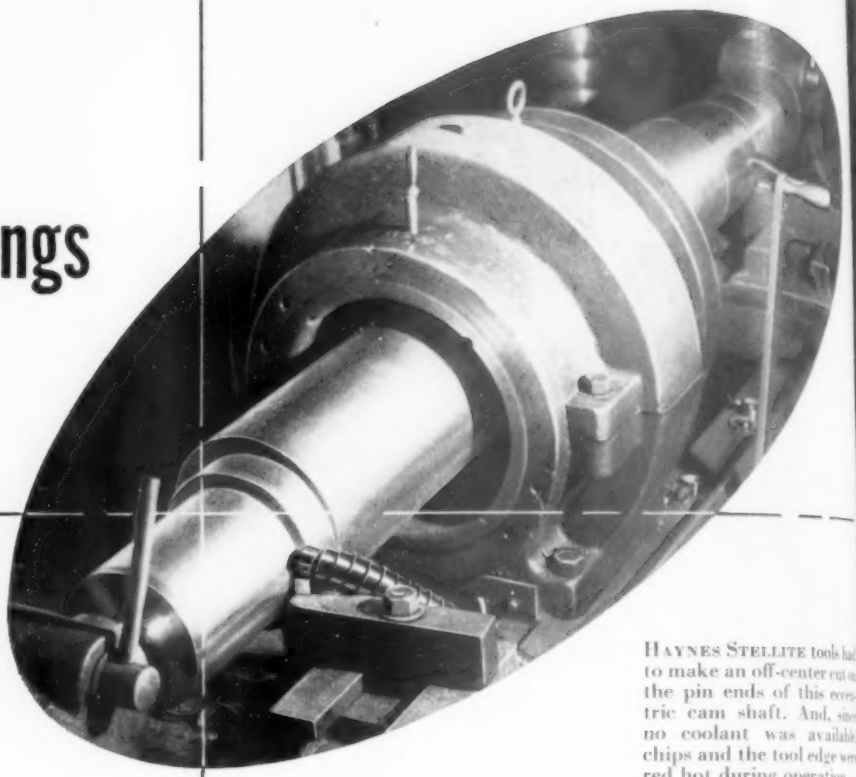
STANDARD TOOL CO.

DEPT. 6-F, 3950 CHESTER AVENUE
CLEVELAND 14, OHIO

New York • Detroit • Chicago • San Francisco

STANDARDIZE AND SAVE WITH STANDARD RED SHIELD METAL CUTTING TOOLS. STANDARD DISTRIBUTORS IN MORE THAN 500 CITIES CAN SUPPLY YOUR REQUIREMENTS.

Off-Center Forgings



HAYNES STELLITE tools had to make an off-center cut on the pin ends of this eccentric cam shaft. And, since no coolant was available, chips and the tool edge were red hot during operation.

MACHINED FAST...

WITH UNAVOIDABLE CHATTER and NO COOLANT

Even though the conditions on this job were unusual, the results give a good idea of the efficiency of HAYNES STELLITE tools. The workpiece was an eccentric gyrator shaft, forged from SAE 4340 steel, with a Brinell hardness of from 240 to 265. This 7-foot shaft vibrated during machining. And, since the shaft was driven at the eccentric cam section and the journal ends machined on offset centers, it was impossible to machine the journals without taking a severe intermittent cut. No coolant was available. Chips and the cutting edge of the tool were red hot.

HAYNES STELLITE tools did this job twice as fast as the material previously used. They had both the red hardness necessary to speed up the operation and the toughness to take the intermittent cut. With a feed of $\frac{5}{8}$ in. per min., and a depth of cut varying up to $\frac{11}{16}$ in., the tools removed nearly 13 cubic inches of metal per minute from the forgings.

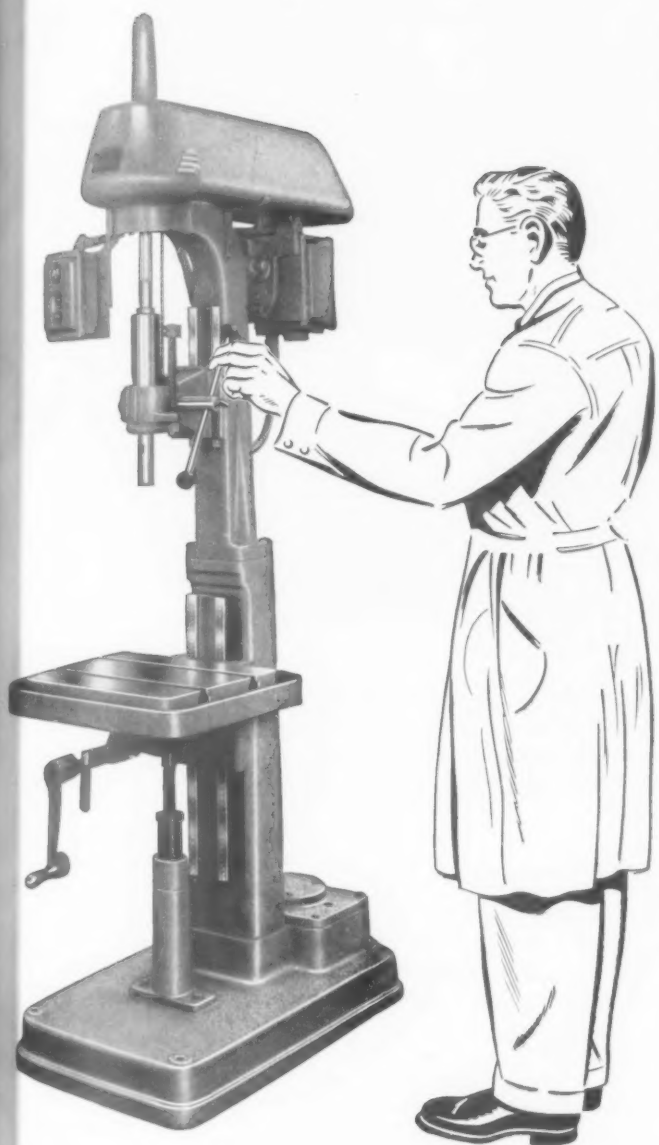
This combination of excellent red hardness and good impact strength in cutting tools may be the answer to your own particular machining problem. For further information, get in touch with the nearest Haynes Stellite Company Office. Ask for a copy of the new manual-catalog, "HAYNES STELLITE Metal-Cutting Tools." It tells the whole story of HAYNES STELLITE cobalt-base tool alloys.

HAYNES
TRADE-MARK
alloys

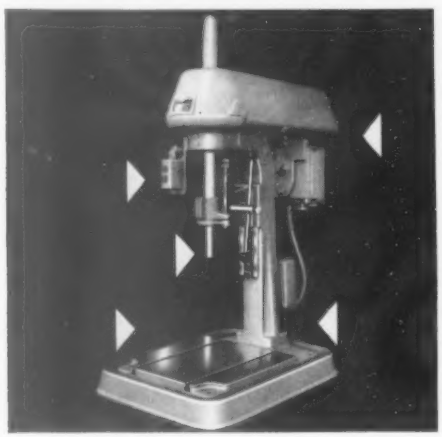
Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.

you can even **feel** them make money



You can tell by the quiet smooth operation of these C-O Cincinnati 16"-3000 drills that they're really built for accurate work, long hours, and consistently high earnings. High production . . . freedom from vibration and chatter . . . plus **the "feel" of a fine tool** are the end result of the extra features that make these drills **"of outstanding value."** And remember, this is just one of many machines available in the complete C-O Cincinnati line to meet all your drilling requirements.



Accurate, alloy steel spindle, mounted in a ground steel quill between permanently sealed high-grade ball bearings. Capacities up to 1" in cast iron.

Full floating drive transfers all belt pull to two additional ball bearings in the spindle pulley.

Hand-scraped head ways cast integrally with the frame provide rigid support for the head. (Counterweight concealed in frame.)

Tilting motor bracket permits easy belt shifting for speed changes without wrenches, helps maintain proper belt tension.

Positive, speedy spindle return is adjustable to changing job requirements.

Write for Catalog D-108 and the name of your dealer.

CANEDY-OTTO DIVISION

cincinnati lathe & tool co.

CINCINNATI 9, OHIO, U.S.A.

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-2-185

"Some 15,000 employees in all branches of our organization are taking advantage of the Payroll Savings Plan..."

SPENCER LOVE
Chairman of the Board, Burlington Mills

"The Payroll Savings Plan is one of the important personnel services offered to the employees of our company. At the present time some 15,000 employees in all branches of our organization are taking advantage of this splendid plan for systematic savings. In times of national emergency this plan assists in stabilizing the economic life of the employee, the community and the nation."

Last call for the 1951 Defense Bond Campaign!

While the campaign was scheduled for six weeks, beginning Labor Day, the *accounting period* will include all Payroll Savings Plan bond purchases and enrollments in September *and October*.

If *you* haven't conducted a person-to-person canvass to put a Payroll Savings Blank in the hands of every man and woman in *your* company there is still time to join the thousands of companies which have added nearly a million employees to the Payroll Savings Plan through person-to-person canvasses.

Phone, wire or write to Savings Bond Division, U. S. Treasury Department, Suite 700, Washington Building, Washington, D. C. Your State Director will give you all the help you need—application blanks, posters, envelope stuffers, personal assistance.

Give your employees an opportunity to save for their future and at the same time, help to maintain America's economic security—put an application blank in their hands

Results of a few recent person-to-person canvasses

Firestone Tire and Rubber Company (40,000 employees), 87% participation; Universal Atlas Cement Company, 67.8% of 4,789 employees . . . Martha Mills, 71% of 2,200 employees . . . Lit Brothers, 52% of 3,600 employees . . . Delta Air Lines, 65% of 2,100 employees; Aerojet Engineering Corporation, 78.1% of 2,000 employees . . . Brown-Lipe Chapin Division of General Motors, 87% of 1,750 employees; Fabricast Division, General Motors, 85% of 1,700 employees.

Person-to-person canvasses now under way include:

	Number of Employees
38 Major Railroads	993,142
Radio Corporation of America	40,000
Owens-Illinois Glass Company	25,000
Cudahy Packing Company	17,000
Pacific Gas and Electric	17,000
Willys-Overland	6,750
Owens-Corning Fiberglas Corp.	6,500
White Motor Company	6,500
Fruehauf Trailer Company	5,700

The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

In Chicago you can find THE ANSWERS TO QUESTIONS LIKE THESE:

Fastest way to learn WHAT'S NEW!

- Have there been major improvements in production equipment recently? *(There certainly have. A visit to the Exposition will convince you.)*
- Can we substitute faster processes to increase productivity, lower costs?
- What about 'quality control'? *(An entire hall devoted to quality control exhibits.)*
- What about foreign machine tools? What is available?
- What about metal forming? Any new developments?
- Is there any way of reducing down-time on machines?
- How about cutting tools? Is there anything new? *(We can assure you "there is!")*
- What about devices to increase machine productivity? *(You'll find hundreds of them.)*
- How can accuracy be increased in machining operations?
- How about easier and simpler tool changes?
- More versatile accessories and controls?
- How can machine speeds be boosted effectively?
- What about simpler machine controls?
- Can we get BOTH increased productivity and lower cost? *(You CAN—and the 1952 ASTE Exposition will be a big help both ways.)*

THE 1952 ASTE INDUSTRIAL EXPOSITION

INTERNATIONAL AMPHITHEATRE
(42nd & Halsted)

CHICAGO, ILLINOIS

March 17-21st, inclusive

Five huge halls of exhibit space with hundreds of exhibits devoted exclusively to what is vital, what is new in the way of production equipment

plus

. . . technical sessions and forums at which outstanding production problems will be fully aired.

March 17—*Inspection and Quality Control Day*
March 18—*Metal Cutting Day*
March 19—*Materials Forming Day*
March 20—*Grinding and Finishing Day*
March 21—*Machine Accessories, Drives and Controls Day*

Get your ticket today. Make your reservations now. Write or wire for *your* advance registration blank.

AMERICAN SOCIETY OF TOOL ENGINEERS
10700 PURITAN AVENUE **DETROIT 21, MICHIGAN**

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-187

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February, 1952

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THE TOOL ENGINEER REGIONAL ADVERTISING OFFICES

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400 Madison Ave.
Phone: Plaza 9-4018
New York 17, New York

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Commercial Bank Building
Phone: Berea 4-7719
Berea, Ohio

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Phone: University 4-7300
Detroit 21, Michigan

WESTERN
Stanley F. Girard
540 N. Michigan Ave.
Phone: Michigan 2-4465
Chicago 11, Illinois

PACIFIC COAST
W. R. McIntyre
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Pasadena 1, California

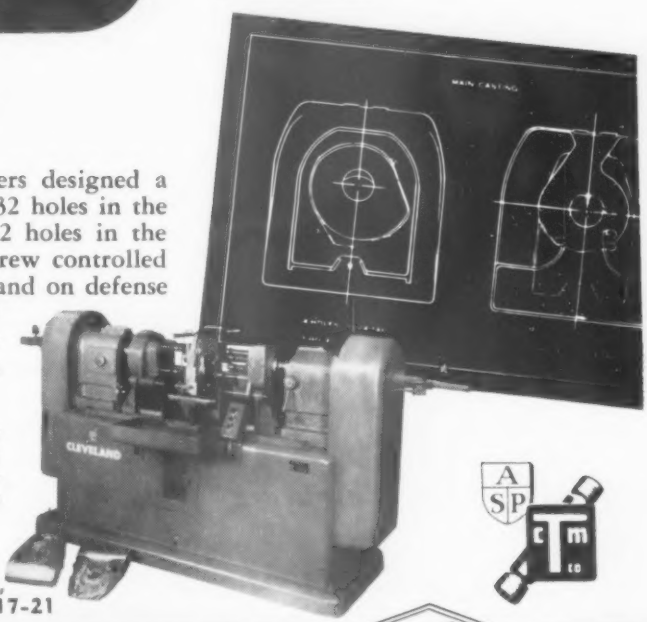
CLEVELAND tapping machines

lead screw

300 PIECES PER HOUR

BOTH SIDES TAPPED IN ONE OPERATION

For a leading appliance manufacturer Cleveland engineers designed a Cleveland Tapping Machine to tap four 10-24 and one 6-32 holes in the top face of the main casting and five 10-24 and two 8-32 holes in the bottom face... both sides simultaneously all with lead screw controlled spindles to assure complete accuracy. On needed civilian and on defense jobs Cleveland Tappers are reducing production costs and saving priceless man hours. With a Cleveland Tapper engineered to the job, a semi-skilled worker becomes a skilled operator.



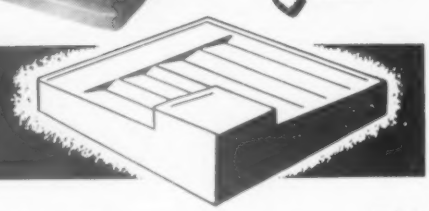
CHECK WITH CLEVELAND FIRST if you need to perform any or all of these operations: Tapping... Threading... Drilling ... Spotfacing... Reaming... Chamfering. Cleveland engineers can help you with your problem, show you how to effect economies in these operations.

Mr. Lead Screw says... Write for your copy of the Cleveland Production Tapping Guide and a copy of Catalog T-12

Visit us at Booth 300. ASTE Exposition, Chicago. Mar. 17-21

THE CLEVELAND TAPPING MACHINE CO.

A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC. · CANTON 6, OHIO



over 3,000,000 parts produced on one machine with

BALAS PUSHERS

BALAS also makes:

- Solid Collets
- Special Collets
- Master Collets
- Squirrel Cage Pushers
- Master Pushers
- Feed Fingers

This particular "run" was reported by a leading automotive and aircraft part manufacturer. Over 3,000,000 parts were produced using Balas Pushers in a Davenport machine...and no pusher failure was encountered. It is not an unusual record for BALAS!

You, too, can obtain outstanding production records with Balas Pushers. They are precision machined from solid bar stock of selected quality. In addition, rigidly controlled heat-treating assures proper spring tension and a hard bearing area.

Use Balas Pushers and be sure of more production and less stock waste. Whether your problem is simple "feeds" or difficult jobs such as long feed-outs, high speeds and scratchless operation, Balas Pushers are essential in turning out good work...and turning it out fast. For peak production—Best Buy Balas!

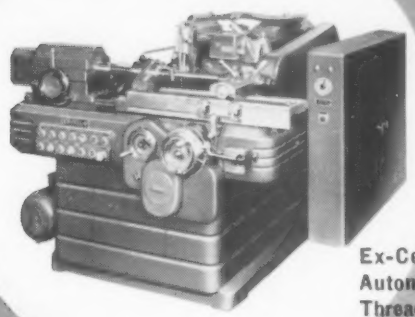
BALAS COLLET MANUFACTURING CO.

1555 EAST 27th STREET CLEVELAND 14, OHIO

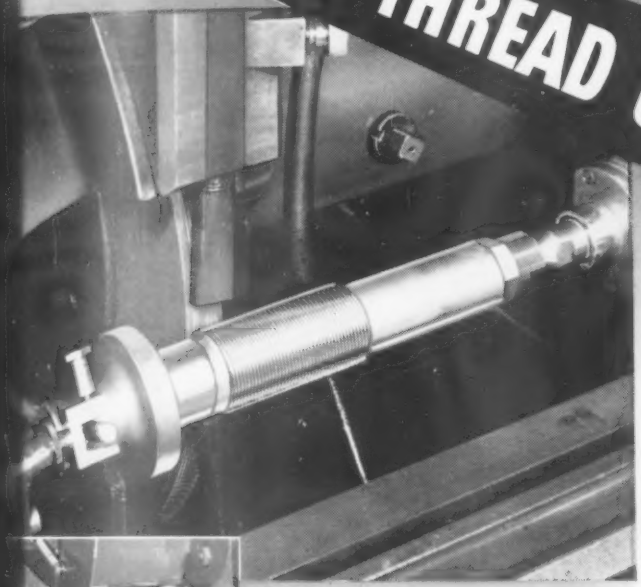
WORLD'S LARGEST MANUFACTURER OF COLLETS EXCLUSIVELY

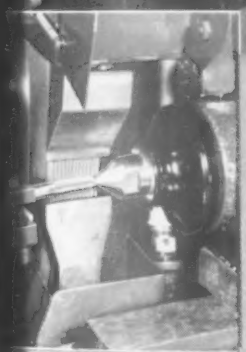
THE BUSIEST MACHINE IN YOUR SHOP

EX-CELL-O AUTOMATIC THREAD GRINDER



Ex-Cell-O Style 33 Automatic Precision Thread Grinder for external threads. Standard models for internal threads and universal models for both internal and external threads also are made by Ex-Cell-O.

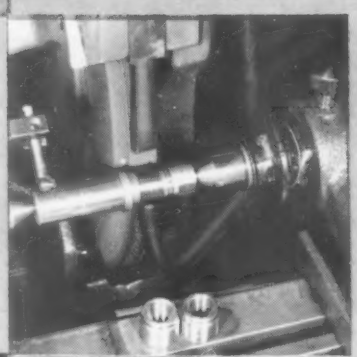




Grinding threads on cast-iron part with diamond dressed multiple-rib wheel on a Style No. 33 Grinder.

-tooth diamond dressed
iple-rib wheel (wheel
is twice pitch of thread)
inding a ⅛"—18 tap.

eading stainless steel
raft bushings on an
Cell-O Style 33 Auto-
atic Thread Grinder.



Grinding threads on the end of a machine gun barrel which is held within a special work head.

For high production with extraordinary precision, Ex-Cell-O Style 33 Automatic Thread Grinder is a popular choice. It is easy to set up and operate. With equipment for using multi-rib wheels, as shown in the accompanying photographs, output exceeds other methods.

Thread grinding is a must for hardened steel parts. More and more shop supervisors are discovering that grinding is also economical for materials that are tough and abrasive, or soft materials that are inclined to tear under the pressure of cutting tools.

For more information on thread grinding call your Ex-Cell-O representative or write directly to Ex-Cell-O. Please state whether you are interested in internal or external threads or both.

XLO

EX-CELL-O CORPORATION DETROIT 32 MICHIGAN

51-28

MANUFACTURERS OF PRECISION MACHINE TOOLS
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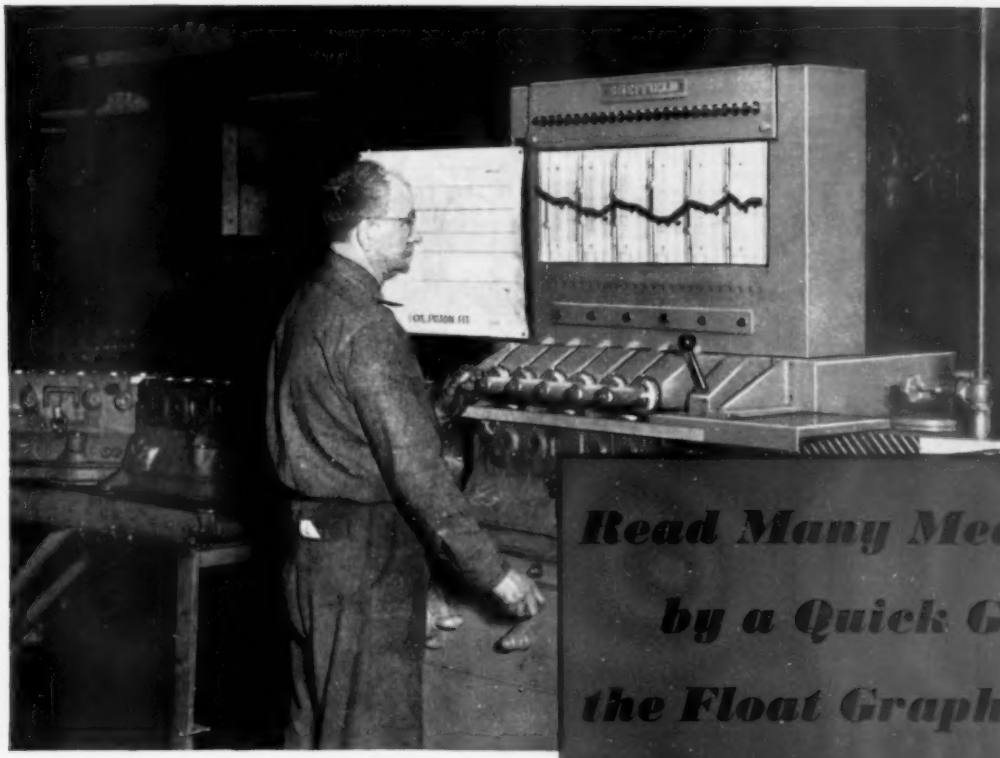
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT



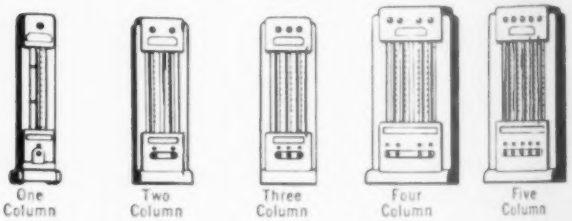
Checking bore diameters at 18 points.

Read Many Measurements by a Quick Glance at the Float Graph ("Airechart")

Checking 27 crankshaft measurements.

Each individual measurement is indicated by the position of a float in its respective Precisionaire column.

The float positions form a characteristic pattern similar to a graph. It's actually a quality control chart. The inspector sees at one quick glance whether the work part can be passed or should be rejected, and for what dimensions. No eye strain, no close concentration, no figures to remember, no confusion of multiple dial faces with the "Airechart."



Standard Precisionaire column instruments are made with one, two, three, four or five columns. Special Precisionaires can be built to include from 6 to 30 or more columns depending on the number of dimensions to be checked.

For complete details on simultaneous multiple measurements with the Precisionaire, call your local Sheffield representative, send prints to us or write for Bulletin CTP-491.

Checking contour of a turbine blade at 18 points.

the *Sheffield* corporation
DAYTON 1, OHIO, U. S. A.

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